THE WELDING ENGINEER

JULY, 1950

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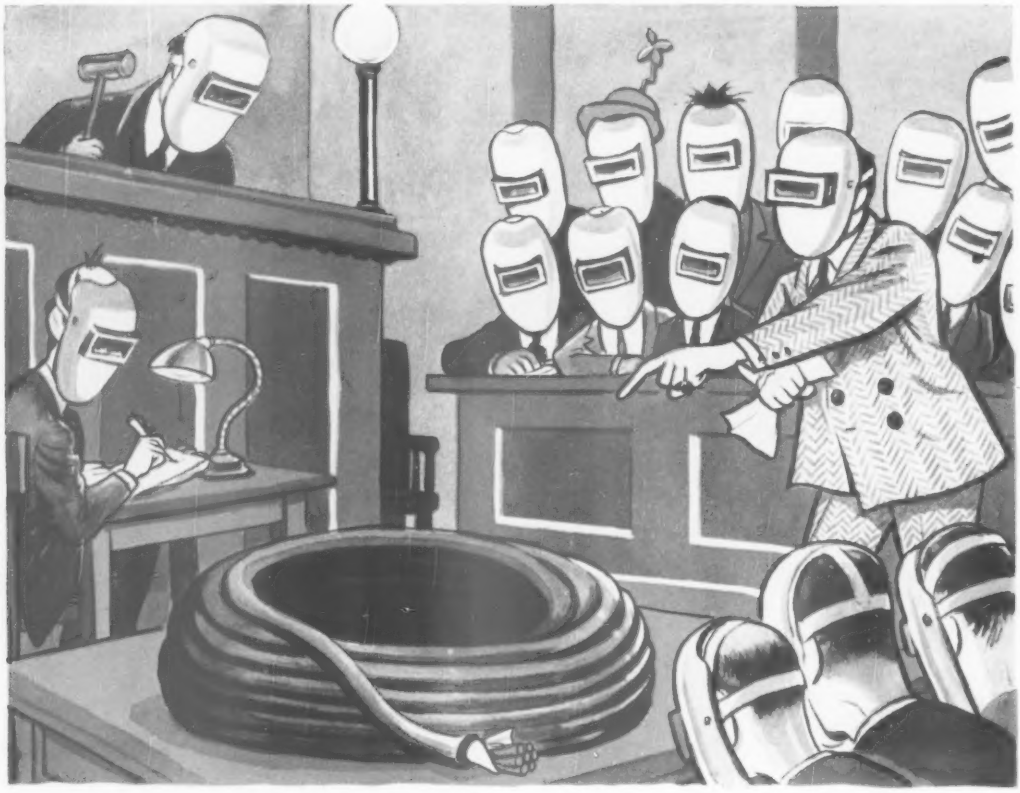
A McGRAW-HILL PUBLICATION



THE PERTINENT TESTIMONY ABOUT WELDING CABLE IS *WHAT DOES IT DO ON THE JOB?*

"Where were you born?"

"Objection."

"Objection sustained."

"How were you made?"

"Objection."

"Objection sustained."

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"That's the pertinent question to ask a welding cable. I come with a clean conductor that makes good contact with the holder. That conductor is made up of thousands of strands for a flexibility that means a minimum of fatigue.

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If your verdict is for lower over-all costs, you'll want to know more about Belden Welding Cable. Ask your Belden distributor.

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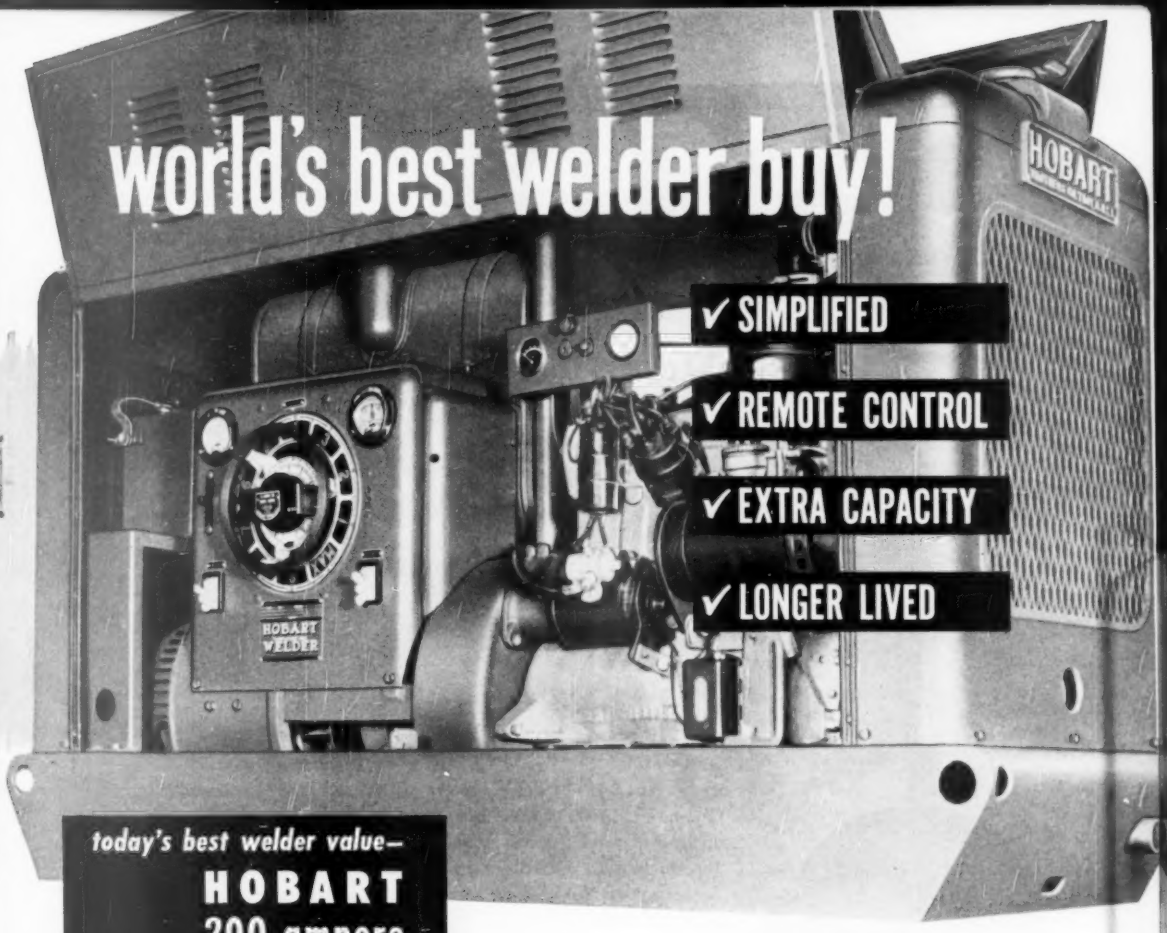

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✓ REMOTE CONTROL
✓ EXTRA CAPACITY
✓ LONGER LIVED

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200 ampere
gas engine driven
"simplified"
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Get the facts and
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Costs less than you'd think

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Cescoweld Filter Plates and Lenses. CESCOWELD filter plates and lenses are carefully rated as to visible non-injurious light transmission and invisible harmful ray absorption qualities. For better visibility and protection use CESCOWELD filter plates and lenses. Protect them with PERMA-CLEAR cover lenses—outlast glass 100 to 1.

It will pay you to write for catalog showing CESCO's complete line of welding helmets and goggles

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THE WELDING ENGINEER

THE WELDING ENGINEER, *with which is combined The Acetylene Journal*

A McGRAW-HILL PUBLICATION

Volume 35 Number 7

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PUBLICATION OFFICE, 210 S. Des Plaines St., Chicago 6. EDITORIAL OFFICE, 520 No. Michigan Ave., Chicago 11. EXECUTIVE OFFICES, 330 West 42nd St., New York 18, N. Y. Branch offices, Chicago, San Francisco, Washington, Philadelphia, Cleveland, Detroit, Pittsburgh, St. Louis, Boston, Atlanta, Los Angeles, Dallas. Published monthly with an additional directory number in June.

McGraw-Hill Publishing Company, Inc. Entered as second class matter Aug. 23, 1948, at the post office at Chicago, Ill., under the act of March 3, 1879.

Subscription rates:

Single copy 50c. United States and possessions, $5.00 per year, $8.00 for two years, $10.00 for three years. Canada $6.00 per year, $10.00 for two years, $12 for three years. Pan American countries $10.00 per year, $16.00 for two years, $20.00 for three years. All other countries $15.00 per year, $25.00 for two years, $30.00 for three years.

THE WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

JULY, 1950

COVER: Operator is trimming end of a thick-walled pipe (without turning it) in order to demonstrate the benefits of a new British cutting torch (page 30).

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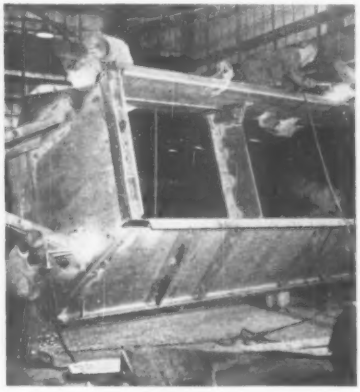
Do 85% of your welding more easily and

WITH JUST 7 TYPES OF G-E

Yes, with just seven basic types of G-E arc welding electrodes, you can successfully handle 85% or more of your general welding jobs . . . in many cases doing a better job more quickly and easily. For the remaining "special" jobs, a total of more than 70 G-E electrode types assure you of precisely the right rod for a given application; for general-purpose welding, however, *you can cut rod stocks by standardizing on these basic 7.*

TYPE W-22—AWS E6010, d-c reverse polarity, all positions; recommended for all types of joints in mild steel. Produces welds of excellent appearance, high tensile strength, ductility, and high impact resistance. Typical applications include pipe-lines, shipbuilding, structural frames, tanks and pressure vessels.

TYPE W-27—AWS E6020-30, a-c/d-c, flat and horizontal positions; recommended for high-speed production of butt and fillet welds on mild steel. Permits higher speeds than other production electrodes, making it particularly suited to jobs where distortion must be minimized.



TYPE W-28—AWS E6012, a-c/d-c straight polarity, all positions. Designed for mild steel, general-purpose welding, this electrode possesses a very stable arc without excessive arc force. Excellent fusion, good appearance with minimum convexity, and easy slag removal.

Your G-E Welding Distributor maintains a complete stock of all G-E electrodes to meet your specific needs. Ask him for a copy of the handy, pocket-size G-E Electrode Catalog, GEC-482. Or write: *Apparatus Department, General Electric Company, Schenectady 5, New York.*

ARC WELDERS • ELECTRODES
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jobs economically ELECTRODES

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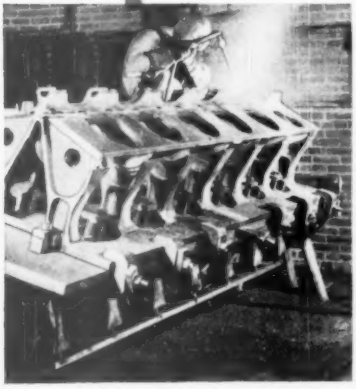
W-2075 FOR MACHINABLE WELDS ON CAST IRON

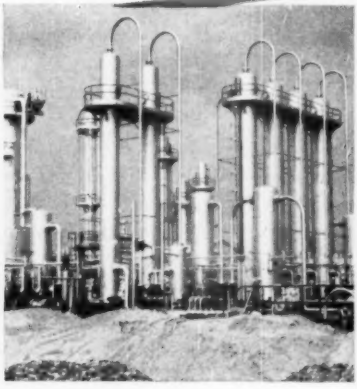
Specifically developed (and recently improved) for making *fully machinable welds* on cast iron, W-2075 is a nickel-core rod that offers such operating advantages as:

1. **Greater welding flexibility—either a-c or d-c, all positions.**
2. **Weld deposits are completely machinable and color matching.**
3. **Exceptionally stable arc—means smoother operation and weld deposits of machine-like appearance.**
4. **Increased resistance to cracking.**
5. **Excellent low-current operation—minimizes brittle heat-affected zone in base metal.**

Try W-2075 on your own work and prove it to yourself. Call or write your G-E Welding Distributor for a sample order today.



TYPE W-32—AWS E6016 or E7016 a-c/d-c reverse polarity, all positions; a low-hydrogen electrode providing higher welding speeds, increased impact strength, and greater ductility. Eliminates underbead cracking when welding medium-carbon steels, sulphur-bearing steels, etc.

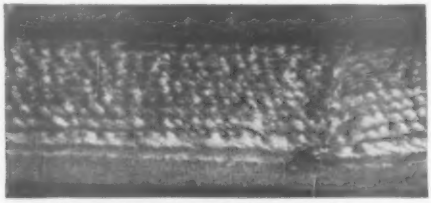


TYPE W-2347—AWS 347-16, a-c/d-c reverse polarity, all positions. A *stainless steel* electrode for welding AISI Types 302, 304, 308, and 347 stainless base metal. (For other special types of stainless, G.E. offers a complete line of stainless electrodes to match specific analyses.)

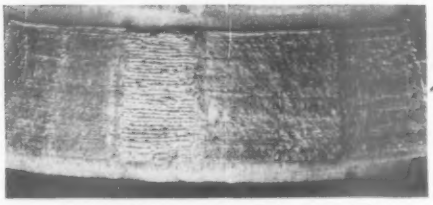
TYPE W-94—For building up or hard-surfacing areas requiring high abrasion and impact resistance, you can't beat W-94. It's an all-position rod especially suited to welding plowshares, hammer mills, scarifier teeth, tractor grousers, rock crushers, etc.

BLAST FURNACE UNIT SHOWS NO WEAR

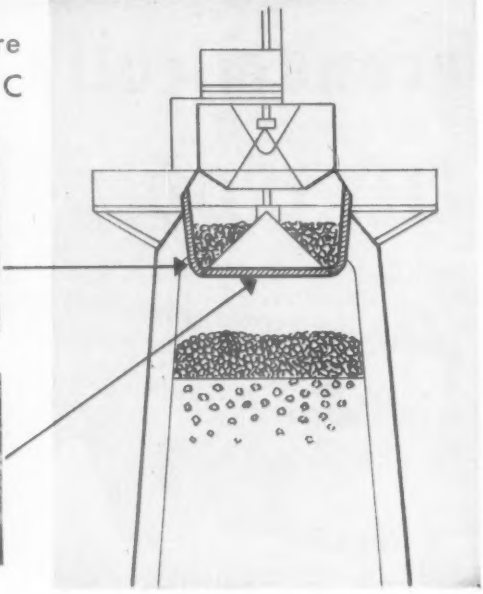
because both BELL and HOPPER were hard-faced with "HASTELLOY" alloy C



Close-up view of hard-faced surface of hopper.



Section of HASTELLOY alloy C deposit on bell.



After a year's service in a top-pressure blast furnace, the HASTELLOY alloy C surfaces on this bell and hopper unit show no signs of pitting, erosion, or wear. The unit resists the abrasive action of various charge materials and the effects of the 250 to 400 deg. F. top temperature.

HASTELLOY alloy C stays hard at the operating temperatures, and deposits made with this alloy maintain their resistance to checking and chipping. Surface hardness can be increased to as much as 400 Brinell by simple cold-working.

Alloy C has already increased the life of other types of steel plant equipment 10 times or more in such applications as blooming-mill hot shear blades, entry guides, twist guide rolls, angular-type guides, and dies and shafts. In these applications, as with the bell and hopper unit, hard-facing results in fewer shutdowns, less replacements, and greatly reduced maintenance costs.

Write for the booklet, "New Hard-Facing Techniques for Protecting Steel Mill Equipment from Wear." It describes some of the many hard-facing jobs that have resulted in large savings through use of HASTELLOY alloy C. In addition to HASTELLOY alloy C, there are many other HAYNES hard-facing rods—for practically every condition of wear, heat, impact, or severe abrasion. For information about any particular application that you may have in mind, contact the nearest Haynes Stellite District Office. Our engineers will be glad to help you.

HAYNES alloys

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● Harris Automatic Welding Torches represent the biggest advancement in torch design since the original Torch. By means of a thumb controlled lever, the full flame is extinguished when not needed (except for a tiny acetylene pilot light) and relit instantaneously, without need for readjustment.

Every time the lever is used, money (oxygen and acetylene) and time are saved. Basically, that's why thousands are in use, especially on production welding work. The original cost of a Harris Automatic is saved many times over during its lifetime.

Further, the seven styles and sizes available are unusually good torches, characterized by exceptional flame range from each size of tip, freedom from "popping" and flashback and stand continuous operation under severe conditions.

Why use 1938 (or older) torches under 1948 conditions? Write us, or contact your nearest Harris Distributor for free demonstration.

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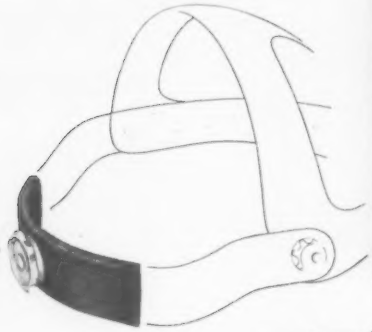
CLEVELAND, OHIO

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

AO Headrest Goggle

It's New!
It's Easy!



"No-Pull, No-Yank" Knob on AO Headrest Goggle adjusts for Any Head Size Quickly!

Added to its unusual comfort and safety the AO F600 Headrest Goggle now offers gas welders, cutters, burners, brazers and furnace men *perfect, positive* adjustment to the required head size *by a slight twist* of a knob. No maneuvering, no yanking is required. Entire mechanism is enclosed in a fibre tube for complete insulation. Headgear is top quality fibre, specially riveted to prevent hair pulling. This is the same famous #4 free-floating headgear that is used on all AO welding helmets. Your nearest AO Safety Products Representative can supply you.

Quick Facts

- Perfect balance, no overhanging weight
- Instant changing to "off-guard" goggle position by a flick of the wrist
- May be worn directly over eyes or over personal glasses
- Well ventilated, indirect side shields keep out stray rays, sparks, metal splashes
- Noviweld lenses in shades 3, 4, 5, 6 and 8 or Noviweld-Didymium lenses in shades 3, 4, 5 or 6
- Replaceable cover lenses available to protect filter lenses

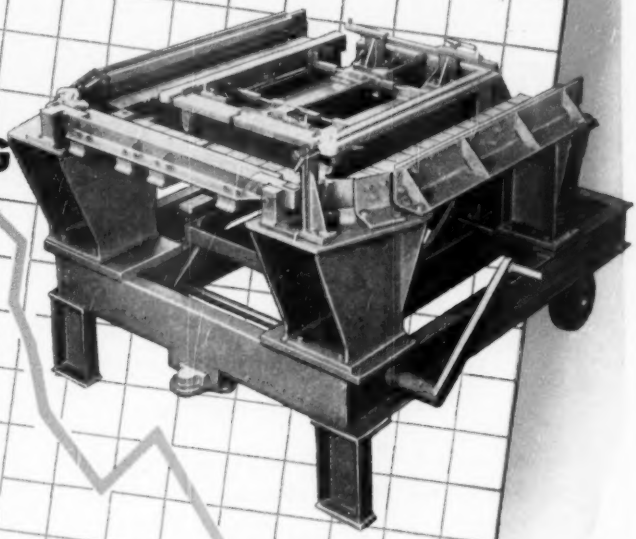
American Optical Company
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

watch production costs DROP!

WHEN YOU USE

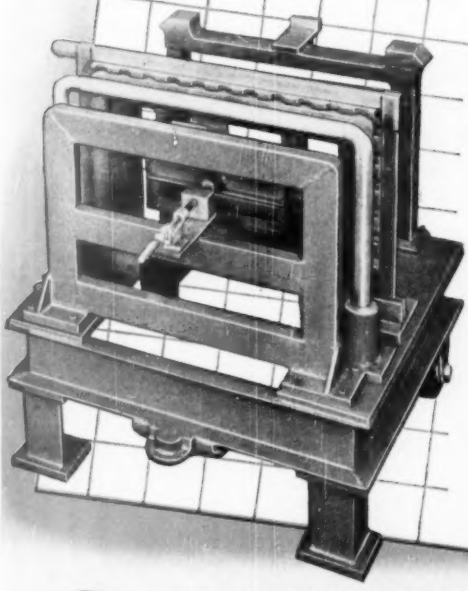
BUNELL SPECIAL* PROJECTION WELDING FIXTURES



* **BUILT TO YOUR SPECIFICATIONS**

The fixtures shown were designed and specially built by BUNELL for fast, easy assembly of space heater bodies by projection welding.

Similar fixtures—built to meet your requirements—can speed up your production and slash your unit costs.



BUNELL SPECIAL FIXTURES CUT ASSEMBLY TIME ON STOVE FRAMES, CABINETS, HEATER BODIES

On the special BUNELL Projection Welding Fixtures shown above, a total of 63 projection welds are made to assemble a complete space heater body in a fraction of the time formerly required.

Among the advantages of this type of BUNELL Fixture are: (1) Parts are welded in a stationary position, with much less handling of cumbersome assemblies. (2) Automatic location of welds. (3) One set of light, air-operated welding guns serve many different fixtures. (4) The fixture can be removed from the welding line by means of built-in casters, and a fixture for another model substituted.

BUNELL Projection Welding Fixtures can be built *for your particular requirements* on stoves, heaters, cabinets or similar sheet metal assemblies to save you time, trouble and money. Send your prints and specifications today for quotation—or write for full information.

WRITE FOR BULLETIN
which shows BUNELL facilities, methods and equipment

BUNELL

BUNELL MACHINE AND TOOL CO.

1601 EAST 23rd STREET • CLEVELAND 14, OHIO

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With *One* OXWELD Blowpipe

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You can do All these Jobs . . .

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- √ **Heavy-duty heating**
- √ **Braze-welding**
- √ **Hard-surfacing**
- √ **Gouging**
- √ **Rivet-cutting**

Whether you want to do one—or more than one—of these jobs, all you need is the OXWELD W-17 Blowpipe with the right welding head or a cutting attachment. You're assured high efficiency and economy because each size welding head has its own tip, mixer and injector to provide the correct flame for its range of metal thickness.

In addition to its adaptability for many uses, the time-proved design and sturdy construction of the W-17 assures dependable, long life. Added years of *trouble-free service* mean the greatest overall saving to you. Write or phone today for full information and a demonstration of this all-purpose blowpipe.

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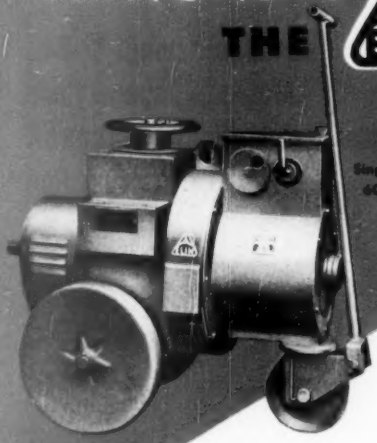
CLINCHER *for New Welding Efficiency!*

THE ELIN D-C ARC WELDER

FEATURING THE CROSS FIELD PRINCIPLE



Model RFN 300

Single Operator 60-375 amp — Motor-Driven 1750 rpm

FULL NEMA RATING

Just watch this easy-breathing d-c welder in action — you'll be sold in a minute. For here's the latest and "best yet" in modern arc welder performance.

Even if you only highspot its design, you'll see how Elin, first name in European welding equipment, has assured superior, speedier welding — at lower cost — all the way.

Effortless control . . . a peppier, steadier arc . . . uniform penetration . . . instantaneous voltage recovery . . . absence of electrode sticking — these are simply hints of the big plus in performance that's in store for you.

For the complete story on the Elin Welder . . . for your new experience in welding efficiency — let us put you in touch with the distributor in your locality.

PROMPT DELIVERY — SPARE PARTS IN STOCK!

ELIN EFFICIENCY — *Right in the design!*

Here's a sample of Elin's perfected package.

COMPACT. Motor and generator, for instance, are built into a single unit. No cumbersome auxiliaries.

STEPLESS, LOSS-FREE REGULATION of the welding current over the entire current range.

PORTABLE. A lightweight machine, but sturdy, arc welded throughout.

VENTILATED for cool operation in toughest service.

DRIP-PROOF ENCLOSURE — all parts fully-insulated.

A few choice territories still open to interested distributors!

american ELIN corporation

Welding Machinery Division

ONE WALL STREET • NEW YORK 5, N. Y.

Worn spindle for 60-ton lathe rebuilt

Estimated saving: $2,343
Method: Oxyacetylene braze welding with ANACONDA 828 Welding Rod

One-ton locomotive lathe spindle repaired by building up worn surface with ANACONDA Nickel Silver 828 Welding Rod. Abe Rosenblum, Shop owner (right) and Tomlin Strouse, representative for O.K.I., inspect finished job.

Metal added to worn surface, 400 lbs. Spindle preheated and held at 600° F. during work. Welding completed in 38 hours. Distortion held to 0.004 in. Estimated cost of a new spindle, $2,800. Cost of weld job, $457.00. Estimated saving: $2,343.00.

MR. A. ROSENBLUM, owner of the Detroit and Cincinnati Welding Co. where this big money-saving job was done, says:

"I wouldn't be without ANACONDA Nickel Silver 828 in a job shop. This 'white bronze' rod is easier to control, has a high tensile strength, creates a harder wearing surface, and it just makes the job generally easier. Many thanks to The American Brass Company and to their distributor, the O.K.I. Welding Supply Company, for furnishing me with a better metal to do better work."

ANACONDA WELDING RODS are available from distributors throughout the United States. For more information on this and other ANACONDA Welding Rods ask the Anaconda Distributor nearest you, or write us direct. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

50188

ANACONDA NICKEL SILVER 828

ANACONDA Nickel Silver 828 is a 10% nickel welding rod for oxyacetylene braze welding of steel, cast iron and nickel alloys—to obtain reasonable color match and for building up worn bearing surfaces.

You can depend on ANACONDA® WELDING RODS

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35,588 STRONG...

22% DECIDED TO BUY SOMETHING THEY SAW AT THE METAL SHOW*

10% BOUGHT SOMETHING DIFFERENT FROM WHAT THEY HAD PLANNED AFTER SEEING IT AT THE METAL SHOW*

20% COMPLETED A DECISION TO BUY SOMETHING AFTER SEEING IT AT THE METAL SHOW*

● You can't find a better audience than the one that attends the Metal Show.

Showing your products and services to over 30,000 men vitally interested in all phases of metal production and fabrication, gives you the best opportunity to sell what you have to the metal industry—to show how it will help achieve "Economy-in-Production".

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From Attendance Report No. 4 in a continuing analysis of Metal Show visitors. If you have not received a copy write National Metal Congress & Exposition, 7301 Euclid Avenue, Cleveland 3, Ohio.

METAL SHOW

OCT. 23-27, 1950

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Know about these New Lincoln Accessories at NEW LOW PRICES?

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"INS" Holder. One of the most popular insulated holders on the market. Light in weight yet ruggedly built. Self-ventilated, properly balanced to cut down wrist fatigue. Rated 250 amps for electrode sizes 1/16" to 1/4".

Lincoln insulated holders sell at amazingly low prices . . . *actually less than often charged for replacement parts on other makes of holders.*

HIGH FLEXIBILITY WELDING CABLE

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THE WELDING ENGINEER

ESTABLISHED 1916 JULY, 1950

The Stakes Are Tremendous

THIS MONTH is the 174th anniversary of the signing of the Declaration of Independence. As a unique way of celebrating the 4th, we might do well to read that extremely important document.

Among the charges the Declaration makes against King George III, there is one particularly worth noting:

"He has created a multitude of new offices and sent hither swarms of officers to harass the people and eat out their substance."

A glance at the daily papers leaves no doubt that present holders of public office are doing as much as they can to make life miserable for business men and "eat out their substance." Note what the Justice Department is trying to do to A & P, Dupont, General Electric and others. Look at the activities of Senator O'Mahoney and Representative Celler. The office holders seem to have forgotten that businessmen are the country's wealth producers.

The attacks of the bureaucrats purport to be confined to "big business," but is that an island or an isolated continent? Are not the politically inspired complaints and persecutions just as harmful to small business? If eventually big business is strangled, how can small business expect to avoid the choking grip of taxation and regulation? Apparently, the object of the choking is to end capitalism and free enterprise once and for all. What else are we to think?

If big business ever was an ogre, its teeth were drawn long ago. There are not nearly as many large enterprises as voters are being led to believe. Two out of every three workers are employed in plants having less than a hundred employees. It's true that many of these small businesses exist by producing parts needed by big industries. The welding field, for instance, has many contract welding shops that fabricate metal products for ultimate assembly in low-cost, mass-produced products. Are these suckers on the tentacles of the octopus of Big Business? Or just guys trying to earn an honest living?

The American system of business, free enterprise capitalism or whatever you choose to call it, is not simple to understand. If it were, the task of defending it would be much easier. Likewise, it would be far easier to protect capitalism through popular education.

A new book*—it should be "must" reading for all who want to preserve our American heritage—does the important job of pointing out plain truths. Says Author Dexter Merriam Keezer:

"Capitalism deserves a thriving future in the United States not only because it is the most productive system ever devised, but pre-eminently because it seems to go hand in hand with political democracy and human freedom."

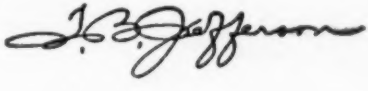
Socialists of a hundred years ago thought that they were associated with political democracy, but look at Marxism now! The facts are that socialism-communism just won't work except under compulsion, whereas capitalism works best when and where men are most free.

To quote again from Mr. Keezer: "Not the least notable contribution of capitalism to human freedom is that it disperses the power to take freedom away. When both government and capitalism are in the field giving direction to human activity, the freedom of the individual can be taken away only in two steps. Both the government and the capitalistic enterprise must act. When the government alone dominates the field, as is the case of socialism and communism, only one step is required to take away the individual's freedom."

Looking back on the Declaration of Independence and the charges it made against the king, it is evident that we have lost a lot of ground in 174 years. A "multitude of new offices" and "swarms of officers" now "harass the people," who are strangely apathetic and unconcerned.

Yet the stakes are tremendous. It is not only our fates as individuals that are at stake but the fate of the oldest functioning democracy.

*_Making Capitalism Work_, by Dexter M. Keezer and associates. Published by McGraw-Hill Book Co., Inc., New York. Cloth, 5½ by 8½ in., 316 pages. Price, $3.50.



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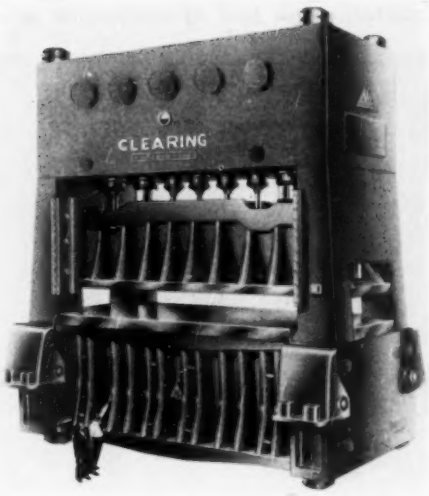
Weld 3,850-Ton Mechanical Press

Because of welding, presses can be built in sizes and capacities so large as to be almost unbelievable. This is the story of the biggest mechanical press that was ever built—a giant 37 ft wide and as high as a four-story building when assembled. Naturally, its great size and weight called for unusual facilities for handling and stress relieving.



3—3,850-TON PRESS (artist's drawing) is believed to be world's largest mechanical press

BY CLYDE B. CLASON

Presses, both mechanical and hydraulic, make up 95% of the work turned out by the Clearing Machine Corp. Located in the Clearing Industrial District, in Chicago's southwest quarter, this large concern has built up a flourishing business on tailor-made presses to stamp out such parts as auto tops or doors, railroad car panels and other large parts of sheet metal.

These presses are surely the elephants of the machinery world! Clearing-made products are fabricated in capacities of from 30 to 6,000 tons. Even the latter figure, huge though it sounds, doesn't represent the ultimate in construction.

As the writer visited the plant, he saw a 16,000-ton (yes ton) press being made for the manufacture of 36-in. piping in 40-ft lengths. This job is distinctly on the special side, however, and is not likely to be duplicated in the foreseeable future.

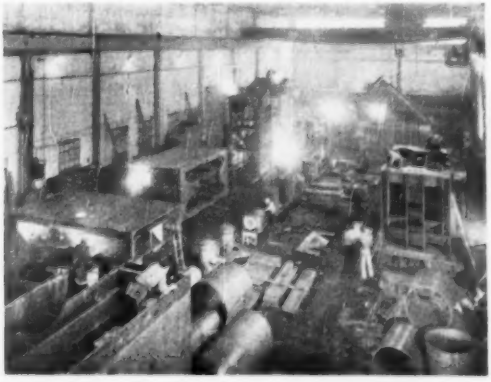
Business is good at Clearing. At present, employees are working three 8-hr shifts per day, six days of the week. To give you an idea of the scope of operations, Clearing currently employs 90 men in its welding department alone (welding and set-up) and in the flame-cutting department has 20 cutters and four layout men. About 45,000 lb of welding electrodes are consumed every month to fabricate around 1,000 tons of steel plate.

It may take anywhere from two days to three months to turn out a press. Usually, about 15 to 20 of these giants of industry are going through the plant at the same time. Because of welding, presses can be built in sizes and capacities so large as to sound almost unbelievable.

Storage and Flame-Cutting

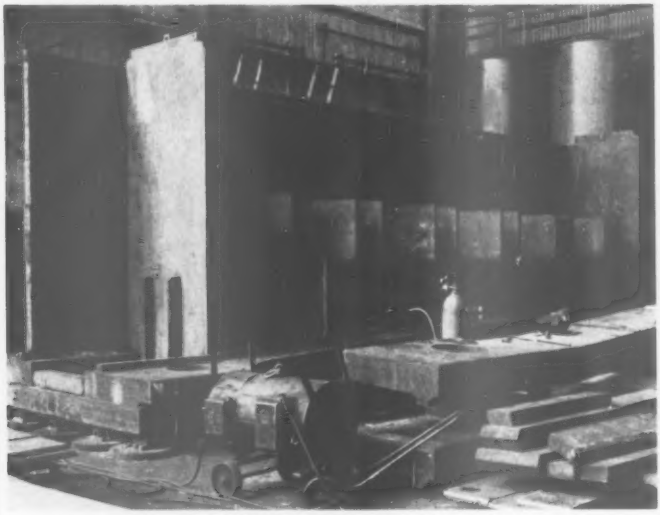
Production begins in the plate storage yard, where steel is unloaded

1—FLAME-CUTTING department at Clearing has five large machines for shape-cutting and three portables



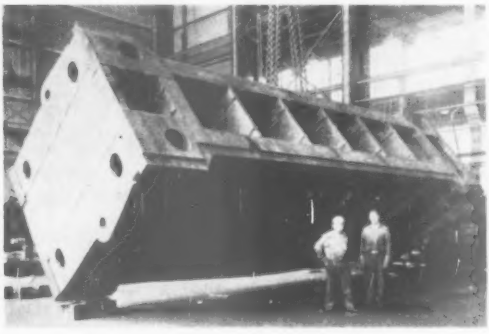
2—MAIN WELDING bay is served by overhead cranes of 30 and 50 tons. Bay is 67 ft wide by 220 ft long

Building the bed of 3,850-ton mechanical press . . .

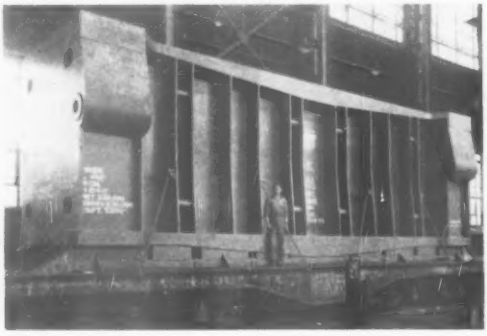


4—ASSEMBLING BED of press pictured in Fig. 3. Bed weighs 175 tons, is 37 ft wide by 12 ft 4 in. high. Welding work took close to seven weeks

5—BED TURNED on end: note the scaffolding rigged for the weldors



6—NEARING COMPLETION, bed is again turned with aid of an overhead crane for further downhand welding

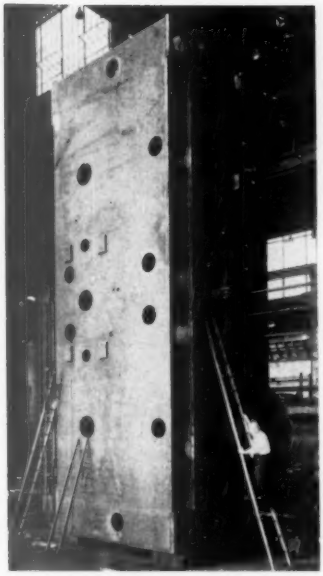


7—ON FREIGHT CAR, bed awaits shipment. Weights of this magnitude require special high-capacity cars

from freight cars with a 20-ton crane and a 48-in. lifting magnet. Plate thicknesses range from ¼ to 14 in. —the latter just about as heavy a steel plate as can be purchased. Stock size of plate is 100 by 240 in., provided that the weight of a single plate is limited to 25,000-30,000 lb. Some exceptions are made to this general rule: single plates weighing as much as 60,000 lb have been handled. All of the plate stock used for the press frames is of mild steel. Alloy steel is used for gears, shafts and other moving parts.

From the storage yard, the plates are taken into the cutting shop (Fig. 1), housed in a bay 67 ft wide by 200 ft long. The plate is carried by a 10-ton overhead crane equipped with a lifting magnet. The department has five multiple-torch shape-cutting machines and three portable straight-line or radius cutters. The smaller machines are largely used for beveling plate edges. The largest of the large shape-cutting machines has a span of 10 ft and four torches; two machines have a span of 8 ft and four torches each; two a span of 6 ft and two torches each. Paper templates are used for shape-cutting, and the operator follows the outline by hand. The templates are destroyed after use as each job is individual and there is no repetitive cutting. Except on very large plates, tolerances are held under 1/16 in.

Thicknesses up to 14 in. can be shape-cut by these large machines. Parts cut out of 6 or 7 in. plate are rather common. In general, cutting is so accurate and the cuts so smooth that little machining is required afterwards. About 700,000 cu ft of oxygen are consumed per month. The oxygen is delivered from a cascade system of 90,000 cu ft, ca-



8—CROWN of press turned on end for welding. This weighs 125 tons

pacity. City gas instead of acetylene is used for the fuel gas.

Modern Welding Department

The welding department, under L. J. McDonough, superintendent of welding, is one of the most modern and best equipped that the writer has had the pleasure to visit. The main bay (Fig. 2) is 67 ft wide by 220 ft long and is served by 50-ton and 30-ton overhead cranes. Adjoining this large welding area is a smaller bay, 50 by 140 ft, with a sunken floor to provide clearance for a 10-ton overhead crane. Smaller parts and subassemblies are welded here, while the larger press sections are fabricated in the main welding bay.

Altogether, the welding department operates 42 arc-welding machines: 27 of these are 500-amp a-c welders and 15 are 400-amp d-c welders. Automatic welding is not used at all because of the difficulties of set-up. Strange as it may appear, there are almost no long, straight outside seams of the type that can be satisfactorily welded by submerged-melt heads.

A press frame is divided into four major components: (1) the base or bed, (2) the two uprights, (3) the slide and (4) the top part or crown, in which the driving machinery is housed. In larger presses, these main assemblies are not welded to each other but are held together by four or six vertical tie rods running from the top to the bottom of the press. This method of fastening permits a big press to be shipped in sections and assembled at the plant where it is to go to work.

Positioning, Stress Relieving

For larger presses, the separate sections may be extremely large units indeed. They are beyond the capacity of any positioner and are positioned for downhand welding by being turned upside down or endwise by cranes. Smaller sections are handled on positioners: the department has two of 7-ton capacity and two of 3-ton. Also very useful in welding is a specially built A-frame on which fairly large structures may be set at a 45-deg angle.

Since all of the work is mild steel, it does not require preheating. Preheating would be a practical impossibility anyway when workers have to climb inside of or on top of the frame to make their welds. Stress relieving, however, is done at 1,175 F in a large annealing oven adjacent to the welding department. This oven is 12½ ft wide, 33 ft deep and 13 ft high. The rule for stress relieving is one hour in the furnace for each inch of thickness of the thickest plate. Thus a press section having a member cut from 7-in. plate (even if only one such member) would require 7 hours of stress relieving.

Despite the very thorough job of stress relieving on large assemblies, welding sequences are set up to avoid distortion insofar as practicable. Sequencing is somewhat limited by the difficulty of handling large parts.

Braces are applied to hold the plates so as to avoid distortion. This method has worked out very well when coupled with stress relieving.

That 3,850-Ton Press

We cannot better illustrate the nature of the work at Clearing than by following one individual job through the plant. This job, far from typical, is a 3,850-ton capacity press (Fig. 3), believed to be the largest mechanical (not hydraulic) press ever built. It is powered by a 200-hp electric motor. This giant of the press world is 37 ft wide, 43 ft high and weighs 750 tons. Because of its great size, it could not be fabricated in the welding department but had to be built, section by section, in a much larger building, the company's main assembly room, where a 100-ton overhead crane is available with a 50-ft clearance under its hook.

For those who like comparisons, this oversize press stands about the height of a four-story building. Because of its great size, it was never assembled at the Clearing plant prior to shipment. Shipping itself was no small task. The great weight of the separate sections necessitated the use of special cars of high-capacity. Railroads have comparatively few of these, and they must be booked for months in advance.

The press was shipped overseas to France, where it is now being used to stamp out railroad car sides and truck and bus frames.

Building the Bed

Despite its vast size, the 3,850-ton press has essentially the same structure as other types of Clearing presses. Its main components are those we have already noted: the bed, the uprights, the slide and the crown.

The bed is a structure weighing 175 tons. It is a 12 ft 4 in. high, 37 ft wide and 11 ft 2 in. from front to back (overall). Fig. 4 shows the bed being assembled in its normal position, and Fig. 5 shows it placed on end to facilitate welding. A better idea of what the bed looks like can be gained from Fig. 6, a view caught by the camera as it was being turned over during welding. Finally, we see it in Fig. 7 on a freight car ready to start on its long journey.

If you've watched these illustrations carefully, you'll have seen that most of the plates in the bed are set vertically. The horizontal plates between the top and bottom rails are each 6 in. thick. This thickness, however, is dwarfed by the rails themselves, which are steel castings 17 in. thick in the middle and tapering down to 5 or 6 in. toward the ends. It would have been utterly impossible to get a plate from which such a heavy cross-section could be flame-cut.

9—600-TON all-welded press of a new design. This is driven from the bottom instead of from the top

10—TRIPLE-ACTION press has three slides: two are above and one is located below floor level

The vertical members of the bed include two side plates 3 in. thick, five cushion separators 3½ in. thick, a dozen or so cushion supports (stiffening ribs) 2½ in. thick and four end plates 1½ in. thick.

Making the Crown

The crown for the same press (turned on end to ease welding) is pictured in Fig. 8. This structure has a width of 36 ft, a front-to-back distance of 8 ft 10 in. and a height exactly the same as the height of the bed—12 ft 4 in. Its total weight is 125 tons. Plate sizes and fabrication were similar to those of the bed.

The slide is the part of the press that holds the upper die. On this press, the sliding part weighs 91 tons—no little weight to lift up from the work or to press down upon it. The slide is 29 ft 2 in. wide, 9 ft 4 in. high and just 5 ft from front to back. Though a photograph of it is not available, an idea of its construction may be gained from the artist's drawing (Fig. 3). The base plate is 7½ in. thick; the side plates 4 in. thick. The top flange (the curved piece in the picture) was torch-cut from 3-in. plate, and the triangular stiffening ribs were cut from 1½-in. plate.

Between the crown and the base of a press are side structures known technically as uprights. On our 3,850-ton press, each of these two side assemblies weighs 37,000 lb and is a boxlike structure formed of 2-in. plate. The width of each of these boxes is 45 in. and its front-to-back distance 8 ft 10 in. Height is equal to the height of the slide plus clearance plus die space—altogether 15 ft 10 in.

The tie rods that hold these colossal assemblies together are steel masts 16¼ in. in diameter and 42 ft 9 in. long. Each of the four "rods" is a forging of solid steel (mild steel) weighing 15 tons. We'll leave it to the reader's imagination to picture the nuts which are screwed at the top and bottom.

Types of Welds

Obviously, it isn't possible in an article of readable length to describe the many welded joints that had to be made in assembling the components of this mammoth press. Most of the butt joints on the bed, crown and slide were double-vee grooves and welded from both sides. This was the preferred type of joint. Single-vee welds were confined to smaller members and to the uprights (where a closed box prevented access to the inner sides).

Horizontal fillets with built-up reinforcement were the preferred type for fillet welds. Every effort was made in positioning to keep to the horizontal type of fillet welds only.

E-6010 electrodes were used for the first passes, and E-6020 electrodes thereafter on downhand butt joints and horizontal fillets. Favored electrode sizes were 3/16, ¼ and 5/16 in.

Each completed assembly was stress relieved according to the rule previously described: 1,175 F at 1 hour per inch of thickness of thickest member. The company had to build an extension onto the furnace in order to handle these oversize sections.

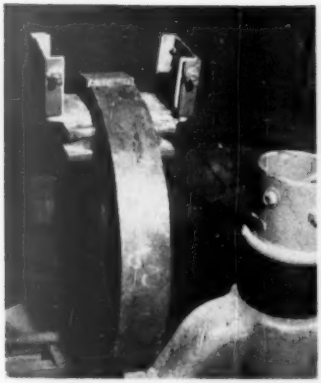
None of these big assemblies was a job that could be turned out in a day—or even a week. Welding work on the bed started on July 23, 1949, and continued until Sept. 8. Work on the slide started on July 21; the part was finished on Nov. 2. The crown was started on Aug. 24 and finished on Oct. 12. Smallest time of all was needed for the uprights, which were begun on Oct. 7 and finished on Oct. 18. When you consider three shifts, 24 hours per day, it totals up to a great many man-hours of welding.

Newer Kinds of Presses

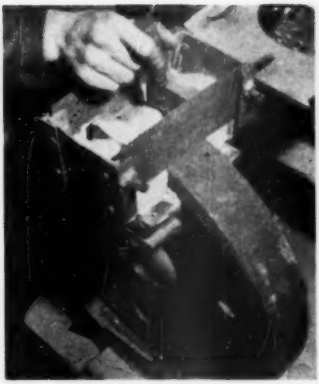
Fig. 9 shows a 600-ton all-welded press of new design. Instead of being driven from the top, as is the case with the large press we have just described, this press is driven from the bottom. The reason for this unusual arrangement is to simplify servicing. Maintenance work is rather difficult when you have to climb on top of a big press and haul up all of your spare parts and equipment from the floor. The floor itself is usually needed for production purposes. Both of these difficulties are avoided by putting the driving mechanism in the bed rather than in the crown of the press and sinking the bed in a pit beneath the floor. Servicing then becomes simple and doesn't interfere with production operations.

The press in Fig. 10 is a 1,500-ton triple-action press that is used to stamp out the curved tops of autos. This press has three slides—one below the floor line and two above. The bed, lower crown and slide are out of sight below the floor. In the part that is visible, an outer slide comes down to hold the work in place and an inner slide then descends to do the forming.

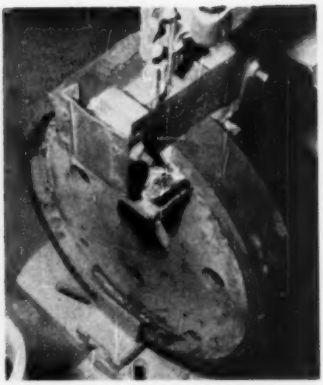
When bigger and better presses are made, Clearing will build them. And it's a safe bet that they, too, will be of all-welded construction.



GEAR BLANK made up and in the fixture for welding. Problem is to weld a rim that's one inch thick



DIKE built to contain the granulated flux. Metal box holds carbon blocks at both sides of the weld



CARRIAGE travels back and forth across the rim to make a multipass weld. It takes about 1½ minutes

SOLIDIFIED slag block lifts off with a pair of pliers. Underneath is revealed the smooth, clean weld

EXTRA METAL, added to allow for shrinkage, is removed by gouging torch. Hub is welded in manually

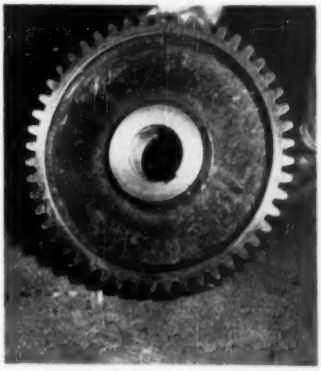
WEB AND RIM are submerged-melt welded at a speed of 15 ipm. This actually is a position fillet weld

Building a Bull Gear

WORKING with process service engineers of The Linde Air Products Co., the Milwaukee Crane Co. developed an effective method of building big gear blanks by means of submerged-melt welding. In this picture series, the web is a circle cut from $\frac{5}{8}$-in. plate; the rim a strip of 3-in. wide 1-in. plate. The rim is bent to the OD of the web and tacked in place. Before welding, it's necessary to build a dike around the veed-out opening. The dike, a metal box, is supported by permanent magnets. The carriage is moved back and forth across the rim as the weld builds up. Current is 650 amp, a-c, and it takes about $1\frac{1}{2}$ minutes to make the weld.

Excess metal is removed with a gouging torch. A section of round is cut for the hub and welded manually to the web. Then the rim is submerged-melt welded to the web on both sides at a speed of 15 ipm.

After welding, the gear blank is annealed at 1,350 F to relieve stresses. Finally, the teeth are cut. About 25 different sizes of gear blanks are made by this method. The one shown in the pictures is 25 in. in diameter by 3 in. wide.



COMPLETED GEAR is ready to be assembled in crane. Teeth are cut, center drilled and keyway cut out

1—MULTITRANSFORMER welding on the primary pump. First operation welds tops of vanes, the second operation middles and bottoms

2—SPOT WELDING the tapping ring to the flange of the primary pump housing

How Chevrolet Welds

Automatic welding with multiple-transformer welders makes it possible for Chevrolet Motor Division of GMC to offer a torque converter transmission on an auto of the popular price class. Automatic welding moved automatically onto the processing sheets for the new device when Chevrolet went to stampings for the components.

This picture sequence shows major operations in the welding of the primary and secondary pumps.

BY STANLEY H. BRAMS

AUTOMATIC welding moved into the automatic transmission picture when Chevrolet, aiming for large production and low manufacturing cost, went to stampings rather than castings for the components of its new "Powerglide" transmission.

The use of the Powerglide makes possible a series of continuously variable gear ratios extending all the way from lowest speed to driving range. Shifting is automatic. The motorist has only to put the control lever on the steering-wheel column in the driving range and step on the accelerator. For especially hard going, he has available a sub-low range of driving speeds, actuated by the control lever. The reverse gear is also actuated by the lever. These latter two options are carried out by a planetary gear arrangement.

Powerglide is a torque converter and, like other automotive torque converters, is built around a driving member (the pump) and a driven member (the turbine). The pump is divided into two sections: a larger primary section bolted to the flywheel and a secondary section anchored to the primary through an overrun roller clutch that lets the secondary rotate faster than the primary pump but never slower.

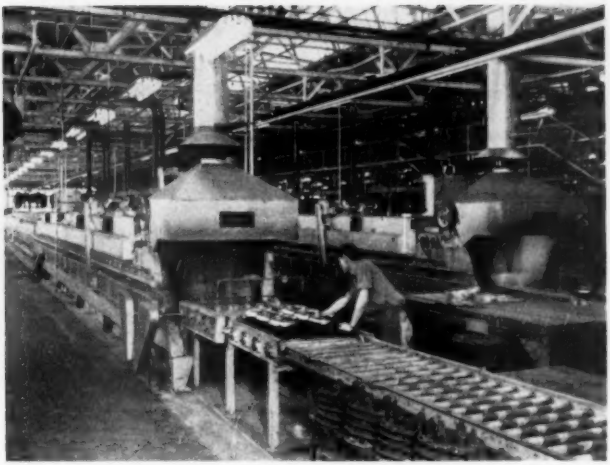
These two members are shaped somewhat like the hollowed-out halves of a grapefruit. Between them is a reactor member, the stator. This, too, is divided into primary and secondary sections. Each of these is free to rotate in the forward direction but neither can rotate backward. Purpose of the reactor member is to function as a torque amplifier when maximum power is required, as at starting and in heavy going. As the turbine speed approaches the speed of the pump, the stator gradually becomes a freewheeling member—without effect on the flow of the hydraulic fluid inside the converter.

The set-up is such that maximum torque is exerted at the start of car movement and utilized as long as (but only as long as) necessary. The appearance of Powerglide is said to mark the first time that a continuously variable transmission mechanism has become available on a car of the "popular price" class.

Primary Pump Assembly

Welding operations on the primary pump assembly are shown in Fig. 1. Machines of the multitransformer type are used for both the first and the second operations. The machine on the first operation has four 30-kva, 440-volt, 60-cycle, single-phase transformers. Its eight

3—SECTION of the primary pump and overrun coupling assembly after brazing



4—CHARGING ENDS of the two brazing furnaces. The trayloads of primary pump assemblies are being positioned for automatic charging

the "Powerglide"

hydraulically actuated guns produce one spot weld at the top of each of 29 vanes. An air-operated positioner carries the assembly into position for the first eight welds, after which it indexes three times. Four times eight would be 32 spot welds, but three guns are cut out on the final index.

The second-operation machine is equipped with six 30-kva transformers and 12 guns. Its job is to weld the vanes to the inner shell in two places: middle and bottom. After the first positioning, the assembly indexes four times. Two guns are cut out on the final index to keep the total to 58 welds.

Fig. 2 shows how the tapping ring is spot welded to the flange of the primary pump housing. The tapping ring is in two semicircular sections. The welding machine is again of the multitransformer type, having six 75-kva, 440-volt, 60-cycle, single-phase transformers. The six guns operate in pairs, in sequence, with pulsation timing—five pulses of 12 cycles. At the conclusion of the first weld, the housing is indexed 180 deg to position the second half of the tapping ring for welding.

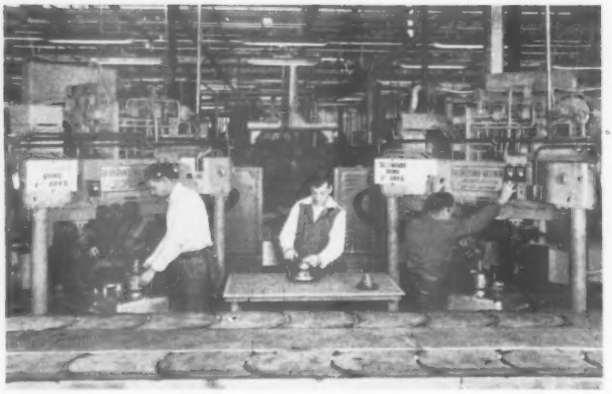
The primary pump and overrun coupling are assembled together by brazing. The outer shell flange is shown at the top of Fig. 3. Next comes the outer shell: it encloses the primary pump vanes after they have been welded onto the inner shell (shown next). The curved vertical vanes which come next have been assembled and staked into their inner and outer shell, which was pressed with a "glove fit" into its position before being coated with copper solution and brazed. The entire assembly is placed, vanes down, on a rack, and the primary pump hub is properly placed with a ring of copper-brazing alloy in position. The whole is then charged into the brazing furnace.

Fig. 4 shows the charging ends of the two furnaces. The trayloads of primary pump assemblies, coated with copper solution, are being positioned for automatic charging. As soon as the furnace doors open, the charging rolls are started. The roller hearth furnaces are 184 ft from door to door. The heating chamber is 40 ft long and contains four zones, upper temperature being 2,050 F. The balance of the furnace length is for cooling. Furnace generators produce an endothermic (heat-absorbing) atmosphere. Electric heating units are removable without stop-

5—FLANGE of outer shell is spot welded to housing of primary pump

6—HUB of primary pump is also spot welded to the housing by guns

7—ASSEMBLING the varied small components that make up the secondary pump



8—FIRST OPERATION (left) is to spot weld the bottoms of the vanes to the outer shell. Second machine welds the tops of the vanes

ping operation. Gross load is 4,680 lb per hour, net load 2,880 lb per hour, in a reducing atmosphere of hydrogen.

The brazed assembly of primary pump and overrun coupling is pressed into the housing and positioned on a pneumatic hoist (Fig. 5). Next, the outer shell flange is spot welded to the housing. The machine doing this job is equipped with two 75-kva, 440-volt, 60-cycle transformers and four guns—two to each transformer in parallel. After the first position, the hoist indexes two times to produce 12 spot welds.

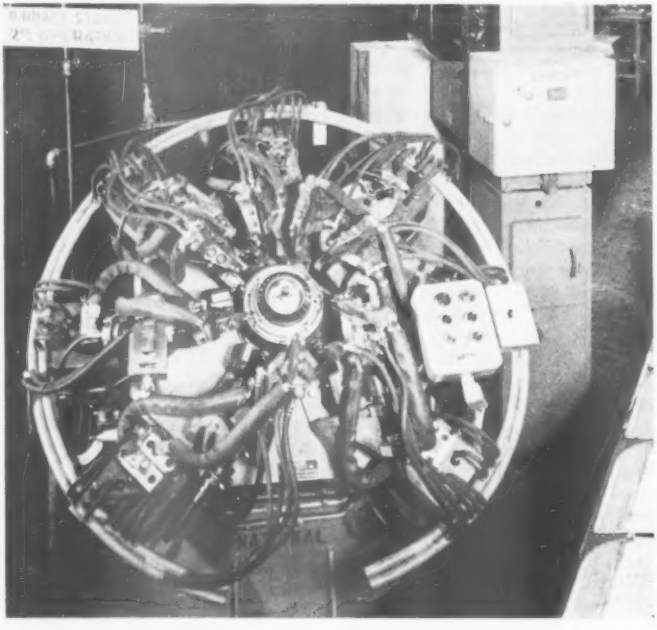
Following the operation pictured in Fig. 5, the primary pump hub is spot welded to the housing. The welding machine (Fig. 6) has three 100-kva, 440-volt, 60-cycle transformers, one for each of the three guns, and indexes once after the first position.

Secondary Pump

The secondary pump is assembled as pictured in Fig. 7. The outer shell (left foreground) is placed in the fixture and 31 accurately formed vanes are assembled inside it. The inner shell (next to the right) is then positioned. The two heads of the fixtures are placed on top and tightened slightly to hold the vanes in place for spot welding.

The fixture with the assembly is placed on the air-operated positioner at the left of Fig. 8. The welding machine is again of the multitransformer type with eight 10-kva, 440-volt, 60-cycle transformers. The eight hydraulically operated guns spot weld the bottoms of the 31 vanes to the outer shell. After the first position, the machine indexes three times, cutting out one weld at the last. The upper part of the fixture is then removed (center of picture), and the balance of the fixture and assembly goes to the second machine, which welds the tops of the vanes to the inner shell. The second machine is of the same type and size as the first.

The primary stator is likewise assembled by multitransformer welding. The first operation, not illustrated, welds the bottoms of the vanes to the outer shell. The second operation welds the tops of 25 vanes to the inner shell. The second-operation machine (Fig. 9) is equipped with seven 30-kva, 440-volt, 60-cycle transformers and seven hydraulically operated guns. The machine indexes three times after the first position, eliminating three guns at the last index.



9—PRIMARY STATOR ready for welding tops of vanes to the inner shell

Big Diesel Repair Job

CENTER picture is an example of the havoc created when a connecting rod cuts loose on an 800-hp Diesel engine. Two of the rod bolt nuts had worked off, putting all of the strain on the other two bolts. This was too much for one of the remaining 1½-in. bolts, which broke off. The nut on the other bolt simply could not hold. The 14-in. piston and the connecting rod burst through the cylinder liner and went on through the upper and lower base of the engine. Just to make a good job of it, the rod bearing cap lodged under the crankshaft, followed the shaft around and slammed through the engine base on the other side. The resulting holes on both sides were big enough for a man to crawl through.

The plant's management naturally expected a protracted shutdown. The chief engineer, however, called in the Leck and Osman Welding Service, of Wink, Texas, to inspect the damage. Weldor R. B. Leck thought that it would be possible to weld the broken castings "cold" by using a new-type welding electrode. Properties of this electrode core and coating permit shallow surface penetration, thus rendering unnecessary the conventional preheat required for cast iron.

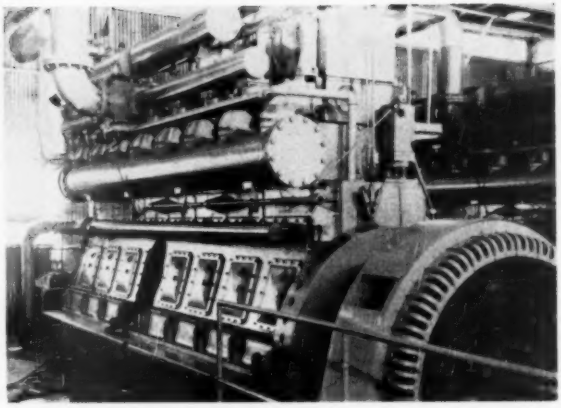
Walls of the castings ranged from 1 to 2½ in. in thickness. Weldor Leck made use of another new product to speed the preparation of edges for welding. Instead of veeing out by torch or with a chipping hammer, he used a metal-arc cutting electrode. This electrode eliminates the need for careful cleaning since the heat of the arc dries out the oil and moisture in the weld areas.

The weldor had to crawl into the engine and sit on the crankshaft to repair the cylinder liner and adjacent section. For the engine base, he had to put all the broken pieces together like a jigsaw puzzle.

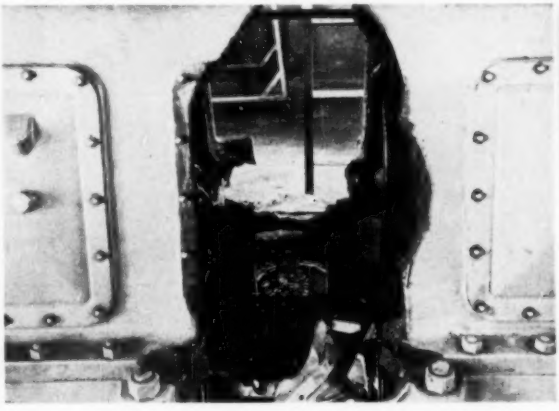
Most of the job was performed with 5/32-in. electrodes, using a current of 120 amp, reverse polarity d-c. To fill in the wide vees on the thicker sections, as many as 100 passes were made yet the casting was never allowed to reach a heat where it showed color. Additional layers of metal were applied with a brazing technique: the arc was played on the weld metal to avoid fusion or puddling of the cast iron.

About 40 lb of cutting electrodes and 150 lb of cast-iron welding electrodes were required. The engine was back in service in comparatively short time. The cost? Total cost for all labor and materials was just over 2% of the cost of the huge 74-ton Diesel.

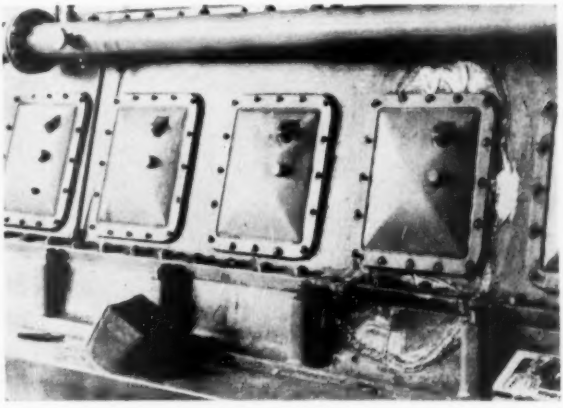
Photos courtesy of Eutectic Welding Alloys Corp.



HOW SIZE OF BREAK (dark shadow) compares to the size of the 74-ton, 800-hp Diesel engine that broke in a Texas plant



EXTENT OF DAMAGE is pictured in this photo. On each side the hole was big enough to permit the weldor to crawl through



FINISHED JOB on the engine base. As many as 100 passes had to be made on some of the thicker sections to fill in the vees

UNLOADING pipe sections alongside ditch. Two men can easily handle a 40-ft length of 8⅝-in. OD pipe

BACK-UP is provided by a chill ring. After welding, it's collapsed and withdrawn for the next joint

WELDING the 40-ft lengths into 200-ft lengths. The inert-arc process is used with 5%-silicon filler rods

FLANGING for junction to steel pipe. Flanges are tacked outside and inside, then finish welded outside

COATING: the "dope" is applied by hand before wrapping the pipe. Coating helps prevent oxide formation

WRAPPING safeguards against outside corrosion. A strip 6-in. wide is wound around pipe with slight lap ➡

Aluminum Pipe Lines

Recent years have revealed the versatility of aluminum and its alloys. Important among new developments is the use of aluminum tubular products for pipe lines to transport gas and oil. In such service, aluminum brings the advantages of light weight, corrosion resistance, reduced fluid friction and other valuable properties.

Light weight helps to offset the cost difference between aluminum and steel pipe. Low maintenance costs are an added saving with aluminum pipe lines.

BY W. B. MOORE

Technical Service Department,
Reynolds Metals Co., Louisville, Ky.

ENGINEERS and metallurgists familiar with the advantages of aluminum have long felt that it would be a good idea to build underground aluminum pipe lines for the transportation of oil and other fluids now carried in steel piping.

Competitive Advantages

(1) The corrosion resistance of aluminum makes it unnecessary in most installations to wrap the buried pipe. Even when wrapping is necessary, the pipe life will be extended by the use of aluminum.

(2) The light weight of aluminum will simplify handling problems and eliminate much heavy equipment and labor. The initial additional cost of the material should be largely offset by these savings.

(3) The reduced fluid friction through aluminum pipe is important. The pressure drop in aluminum extruded pipe is 5 to 10% lower than in steel pipe, simulating the coefficient of glass tubing.

(4) For overhead river and stream crossings and bridge crossings, aluminum requires only one third the weight of steel pipe of same capacity.

(5) Aluminum scrap has high recovery value. Other sizable savings are presented by the fact that aluminum requires no painting nor maintenance.

The Interstate Oil Pipeline Co., Tulsa, Okla., became interested in aluminum pipe for crude oil service as far back as 1947. This company installed ½ mile of 4½-in. OD aluminum pipe along the bank of the Intercoastal Canal in the marsh country of southern Louisiana; ½ mile of 4½-in. OD and 5½ miles of 6⅝-in. OD pipe in the sour crude oil fields of southwestern Arkansas. A five-mile section of 6⅝-in. pipe was laid in one string at a cost very near that of steel pipe. The decreased cost of installation made up for most of the difference in cost between the aluminum and steel. Even though portions of the lines were installed unwrapped, the pipe dug up for inspection has been found to be in excellent condition.

Aerial River Crossing

The use of aluminum for gas lines was first attempted in the summer of 1949 by an oil company for an aerial river crossing. The installation, made with the aid of Reynolds Metals Co. engineers, consisted of eleven 30-ft joints of 10¾-in. OD 63S-T5 extruded pipe with 3/16-in. wall. The line was suspended over the north fork of the Little Colorado river near Bowie in Oklahoma by means of a lightweight cable suspension. The total span from pier to pier was 318 ft. All joints were welded, using an oxyacetylene torch.

The aluminum line, supplied in 30-ft lengths, was welded on a wooden scaffold behind one pier. As each new length of pipe was welded in place, the line was pushed ahead 30 ft onto the cable suspension system so that a new length could be placed in position on the scaffold and welded to the end of the string. All of the pipe was supported from a 1¼-in. steel cable hanging in a catenary from pier to pier.

Cable slings were located at 30-ft intervals along the lengths of this suspended cable. Of somewhat unusual construction, these slings were designed to facilitate the movement of the pipe line across the river. Each consisted of two ¼-in. cables attached to a turnbuckle suspended from the main cable. Vertical adjustment of the sling could thus be made to level the line pipe after it had been brought up to the final location across the river.

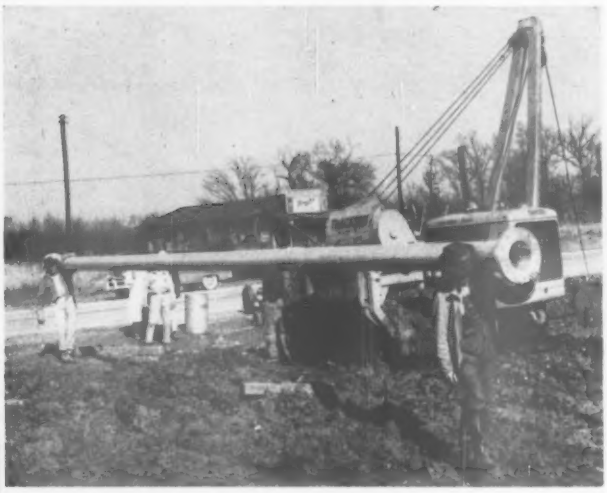
Two 150-lb drilled flanges were welded to the opposite ends of the aluminum string to permit it to be flanged to the main steel line on either side of the river. These aluminum flanges (61S-T6 alloy) were insulated from the steel flanges with phenolic-impregnated gaskets. As a further safeguard against galvanic attack between the two metals, small Micarta tubes and gaskets were used to insulate the steel bolts from the aluminum flanges.

This installation has several important points that should be noted:

First, its low cost of construction, which was considerably less than similar steel crossing. Second, no maintenance (cleaning and painting) will be required. Third, a much smaller suspension could be used since the aluminum line weighed approximately a third what a steel line of the same dimension would weigh.

Underground Gas Line

A second installation of aluminum pipe for natural gas service was recently completed by the Alabama-



CARRYING: Imagine two men carrying a steel pipe this size! This is the 40-ft section that was installed bare to check on corrosion

LOWER-IN: Pipe is "punched" under the road by hand through a steel culvert

Tennessee Natural Gas Co., Florence, Ala. This line (a part of a new distribution system) consists of 1.8 miles of 8½-in. OD, ¼-in. wall, 63S-T6 aluminum extruded pipe. The pipe was furnished in 40-ft lengths beveled for welding. The 30-deg bevel was made at the pipe manufacturer's extrusion plant.

The line extends from the gas company's main trunk line to the Listerhill, Ala., plant of the Reynolds Metals Co. The gas company chose a site parallel to a highway and within 10 ft of it. In choosing a site so near a highway, they minimized the saving that can be obtained in handling aluminum. The decision was based on the fact that the chosen location made it possible to have a metering station at either end for pressure-drop tests over long periods of time.

The welding was done with a portable 300-amp, gasoline-driven, d-c arc welder. All of the welds were made by inert-arc welding, using a current of 300 amp and 3/16-in. filler rods of the 5%-silicon type.

At the time of the installation, the Alabama-Tennessee Natural Gas Co. was in the midst of an extensive program of pipe-line construction. Contractor for this program was Lehman-Hoge & Scott, Harlington, Tex., which was also awarded the contracts for the aluminum line. The contractor's weldors were not familiar with either inert-arc equipment or aluminum welding, so welding instruction and supervision were supplied by the Reynolds Metals Co. The actual welding was done by line weldors of the Lehman-Hoge & Scott Co.

Nine Steps in Pipe Lines

Most pipe-line construction requires nine steps from beginning the construction to backfill and cleaning out the site. These steps are: (1) clearing right-of-way; (2) grading right-of-way; (3) stringing pipe; (4) ditching; (5) line-up, bending and tacking; (6) welding; (7) cleaning, priming, painting, wrapping; (8) lowering in; (9) backfilling and cleaning up.

Essentially, clearing, grading, ditching, backfilling and clean-up operations should be the same with either steel or aluminum piping. It is reasonable to expect, however, that the lighter weight aluminum pipe will be cheaper to string. The facts that welding can be done with one pass, will require no tacking and can be easily lined up should decrease welding costs. Aluminum pipe requires no cleaning before greasing and wrapping, which should lower the cleaning, painting, priming and wrapping costs. As to the lowering-in, aluminum pipe is much easier to handle because of its lighter weight. Cost savings will not be apparent here, however, unless lighter equipment is used.

To string the pipe, one 40-ft lowboy was required. One driver and two unloaders did the work. A tractor pulled the lowboy along the right-of-way while two men walking beside the truck easily lifted the 320-lb lengths of pipe off to the ground. The pipe came off just about as fast as the men could walk. Such speed wouldn't have been possible with steel since each length of steel pipe would have weighed about 950 lb. The substantial saving effected in this operation is shown in Table I.

Savings in Welding

Bell-hole joints were kept to a minimum: most of the aluminum pipe was welded into 200-ft lengths by roll welding. The crew had only to place a removable chill ring in each joint, apply a pipe clamp and roll the pipe by means of a short lever operated by the weldor's helper. Roll welding made possible much faster welding than the bell-hole process. Welding time was cut by one third to one half.

Table I. Comparative Costs for 8⅝-in., ¼-in. wall, Pipe Line

	Steel	*Aluminum*
Clearing right of way per ft	$0.040	$0.040
Grading right of way per ft	0.060	0.060
Stringing pipe per ft	0.069	0.033
Ditching per ft	0.120	0.120
Line-up, bending, tacking and welding per ft	0.168	0.096
Cleaning, priming, painting and wrapping	0.132	0.087
Lower-in	0.038	0.038
Back-fill and clean-up	0.055	0.055
Supervision	0.067	0.067
Move-in and move-out	0.027	0.014
TOTAL COSTS per ft	$0.776	$0.610

They attached a 40-ft rod to the removable chill ring to move it from joint to joint. This ring accomplished two purposes: (1) to aid in lining up the joints: (2) to prevent "icicling" into the interior of the pipe. The latter was especially important since irregularities of the inside surface would increase the pressure drop through the pipe.

Once the weldor became familiar with the metal and the equipment, he was able to produce 10-20% more welds than the usual weldor produces in steel. One weldor, one helper did the welding, rolled the pipe and handled the clamp.

The welds were made in one pass without tacking. Increased speed of welding, the elimination of tacking and manual rather than machine line-up were the welding advantages of aluminum.

Aluminum pipe is considerably easier to bend than steel. Even more important, the modulus of elasticity of aluminum alloys is approximately ⅓ that of steel. The aluminum is therefore more flexible and will conform much easier than will a steel pipe of similar dimensions. As a general rule, aluminum pipe will bend three times as much as steel without having to resort to heavy machine bending to force a permanent set.

Coating and Lowering-in

The coating on the pipe was applied by hand; so was the wrapping and the sealing paint. The saving effected in this operation was in the preliminary cleaning. The aluminum pipe, since it had no mill scale and had not been affected by the atmosphere during storage, required no preliminary cleaning before priming and painting, etc. This saving is also shown in Table I.

There wasn't any actual saving in the lowering-in operation since the contractor used the same booms that he would normally have used for a steel pipe line. Equipment cost is the predominant factor, and in this case there was no appreciable difference in cost. A very definite saving can be made, however, if equipment designed to carry one third the load normally encountered in 8-in. pipe is used.

The contractor showed quite a saving in his move-in and move-out costs. Here he did use less equipment in the installation of the aluminum line than would have been necessary in the installation of a similar steel line.

Comparative Costs

Table I shows that the total costs per foot amounted to $0.776 with steel, $0.610 with aluminum. The total savings with aluminum, therefore, were $0.166 per foot.

For material cost comparison, the steel prices are computed based on $135 per ton delivery to Florence, Ala. The comparative prices would be: for steel, $1.51 per ft: for aluminum, $2.35 per ft. The aluminum pipe thus cost 55.4% more than the steel. From the figures shown in Table I, you can easily calculate that the installation costs on the aluminum pipe were 21.4% below that of the steel. If the aluminum pipe had not been coated, the installation cost would have been 32.6% lower.

On an overall basis, the aluminum pipe line went in at a cost of 29.5% greater than that of a similar steel line. Had the aluminum not been coated, this would have been only 25.5% greater.

The site selected for the aluminum installation was not especially favorable to the aluminum and full advantage was not taken of the light weight and ease of handling of the pipe. In right-of-ways where it is more difficult to get in equipment and transport the pipe, the aluminum would show up much more competitive in cost. In mountainous and marshy installations, for instance, aluminum pipe will show considerable savings on the overall costs over steel pipe. From the handling standpoint, say the gas company officials, the installation of an 8-in. aluminum pipe line is equivalent to the installation of a 3½-in. line in steel.

Bypass for Test Data

For test purposes, a 40-ft bypass was installed in this pipe line. This bypass is bare: its purpose is to show the corrosion resistance of the aluminum pipe. From time to time, the gas company and Reynolds Metals will coöperate in digging up the bypass for inspection. Valuable data on the performance of bare aluminum pipe in the ground will thus be obtained.

The line was designed to work at pressures of from 250 to 500 psi; it was tested in water at 500 psi. Bursting pressure is around 1,300 psi. The connecting flanges are of 61S-T6 aluminum, manufactured by Tube Turns, Inc., Louisville. They were insulated from the steel lines by means of a phenolic gasket. Phenolic inserts around the bolts used to connect the two kinds of flanges keep the steel bolts from any contact with the aluminum.

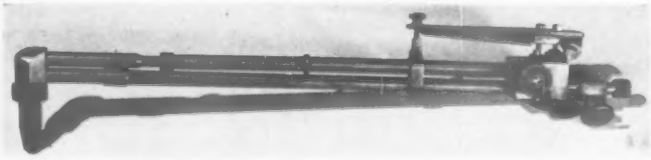
Based on the extensive test programs undertaken, the advantages of aluminum pipe lines are:

1. Decreased handling costs due to light weight.
2. Elimination of wrapping in many soils.
3. Elimination of pipe cleaning where wrapping is required.
4. Reduced welding costs due to fewer passes and faster line up.
5. Elimination of painting and other maintenance in open installations.
6. Elimination of heavy suspension in overhead systems.
7. Decreased pumping costs due to lower coefficient of friction.

In some places, aluminum pipe is economically justified by better corrosion resistance and longer life. There will also be instances where the overall material and installation cost of aluminum pipe will actually be less than that of steel pipe.

Test 1: ½-in. Plate	Test 2: 1-in. Plate	Test 3: ½-in. Plate	Test 4: 1-in. Plate
Cutting speed: 14 ipm	Cutting speed: 11 ipm	Cutting speed: 12 ipm	Cutting speed: 10 ipm
Gas: dissolved acetylene	Gas: dissolved acetylene	Gas: propane	Gas: propane
Gas pressure:	Gas pressure:	Gas pressure:	Gas pressure:
Standard 8 psi	Standard 8 psi	Standard: 4 psi	Standard: 4 psi
Buckle 6 psi	Buckle 8 psi	Buckle: 4 psi	Buckle: 4 psi
Oxygen pressure: 45 psi	Oxygen pressure: 50 psi	Oxygen pressure: 45 psi	Oxygen pressure: 50 psi
GAS	GAS	GAS	GAS
Standard torch .....32 mm	Standard torch .....31 mm	Standard torch .....14 mm	Standard torch .....15 mm
Buckle torch ..... 5 mm	Buckle torch .....10 mm	Buckle torch ..... 7 mm	Buckle torch ..... 7 mm
Saving: 27 mm or 84.3%	Saving: 21 mm or 67.7%	Saving: 7 mm or 50%	Saving: 8 mm or 53.4%
OXYGEN	OXYGEN	OXYGEN	OXYGEN
Standard torch .....63 mm	Standard torch .....66 mm	Standard torch .....59 mm	Standard torch .....59 mm
Buckle torch .....39 mm	Buckle torch .....40 mm	Buckle torch .....47 mm	Buckle torch .....52 mm
Saving: 24 mm or 38.1%	Saving: 26 mm or 39.4%	Saving: 12 mm or 20.3%	Saving: 7 mm or 11.85%

British Cutting Torch



1—RADICAL CLAIMS are being made for the Buckle cutting torch with regard to savings in oxygen and fuel gas (see the test data given above)

FRONT cover this month pictures a British cutting torch said to be built on an entirely new principle of design. It has been used with satisfactory results in a British steel foundry for well over a year. Its job is to cut off headers and risers. The flame-cut surfaces are described as "of high quality," and the ease with which the torch can be used appeals to the operators.

The main assertion of Inventor L. G. Buckle, however, relates to saving in fuel-gas consumption. A series of comparative tests was made with the new torch (known as the Buckle torch) against a well-known standard type of conventional design. The fuel-gas consumption (with either propane or dissolved acetylene) is declared to be less than half that of the standard torch. This claim deserves serious attention.

USES EVOLVED HEAT

When metal is cut by the flame, large quantities of heat are evolved. The Buckle torch takes advantage of this secondary source of heat generated in the burning metal itself and makes a proportionate reduction in the consumption of the heat-producing gases. Its structure is as follows:

The oxygen and fuel-gas supplies are each split into two separate, balanced flows at the inlet valve. One flow is continuously maintained, while the other passes through valves linked to the cutting-oxygen valve. The set-up is such that these valves are closed when the oxygen stream is opened and vice versa. Let us see what happens in both the preheat and cutting positions:

In the preheat position, fuel gas and oxygen are fed to the tip via *both* alternative paths. This gives a balanced preheat flame. In the cutting position, on the other hand, gas and oxygen are fed only through *the uninterrupted paths*. This gives a considerably smaller flame but one sufficient to maintain the heat. The relative sizes of the ducts are such that the maintaining flame is correctly balanced in the cutting position, provided the flame was balanced correctly in the preheat position by the initial adjustment of the inlet valves.

If the recommended supply pressures are correctly used, the preheat flame should be in balance with both inlet valves fully open. This is a very important point, as it permits the torch to be used with ease by semi-skilled operators.

HOW TESTS WERE MADE

In making the comparative tests, the fuel gas and oxygen were led from the supply points through flowmeters of standard type. These were not calibrated to read direct in rate of flow per hour but were provided with a millimeter scale. The zero reading represented a certain small rate.

The Buckle torch and the standard type for comparison were fitted to a standard automatic cutting machine. All conditions of supply pressure, tip size, cutting speed and plate thickness were identical for the two torches. To obtain unequivocal results, all tests were made with the fuel-gas valve fully opened; the oxygen valve was the only one adjusted to get a correctly balanced preheating flame.

TEST RESULTS

All of the tests described here were carried out with 1/16-in. tips in both cutters.

The accompanying tables show

2—TORCH in use on a 2-in.-thick pressure vessel: mass of oxide near tip indicates the start of the cut

3—SKIMMING OFF to the finish line—same cut as in Fig. 2. Surfaces are described as "of high quality"

Said to Save Gases*

the results of four of six tests made to compare the oxygen and fuel-gas consumptions of Buckle and standard torches. Data are not summarized for the two tests made on 1½ in. plates, but the savings found were:

With acetylene—
Gas: 16 mm or 64%
Oxygen: 19 mm or 28.8%
With propane—
Gas: 7 mm or 43.7%
Oxygen: 8 mm or 11.43%

The savings thus range from 13.7% to 84.3% for fuel gas and from 11.43% to 39.4% for oxygen. The average of the six oxygen percentages is 25%; of the three acetylene percentages 72% and of the three propane percentages 49%.

Gas and Oxygen Use

It is clear from the above that the gas consumption in the Buckle torch is considerably smaller than in the standard torch. The average for the six tests shows that it is only 35.4% of that in the standard torch, thus representing a saving in gas of 64.6%.

This is considerably greater than the cut-off caused by opening the cutting-oxygen stream. Clearly, the torch is designed to bring about other economies in gas consumption. In other words, the gas consumption in the preheat flame of the Buckle torch is also below the standard torch.

4—FINAL BEVELING—another Buckle torch job—prepares 2-in.-welded pressure vessel to receive the steam header that will be arc welded to it

The quality of the cuts made during these tests was said to be fully up to the standard obtained with the normal torch used for comparison. The cutting speeds were, however, deliberately chosen so that cutting was relatively easy.

Tests were also made on mild steel ¾ in. thick with the 1/16-in. tip of the Buckle torch. At the test rate of 11 ipm on propane, it was found that a cut of high quality could be maintained with the gas flow down to about 35% of its full value. With the gas valve fully open, cutting was possible at speeds up to and above 20 ipm. Drag is noticeable at this speed, but the cut leaves nothing to be desired.

In the front cover illustration, the operator is using a Buckle torch to trim the end of a heavy pipe. He is following his cut without rolling the pipe in order to demonstrate what is practically equivalent to overhead cutting.

Fig. 1 shows the hand torch, which incorporates a leverage action on the main cutting valve rather than the commonly employed "butterfly" valve.

Fig. 2 pictures the torch in use on a heavy forged container for steam. The wall of the vessel is 2 in. thick. The mass of oxide visible near the nozzle indicates the start of the operation; the 2-in. metal was blown through to establish a starting point.

In Fig. 3, the operator is skimming off the cut to the finish line. Fig. 4 pictures the bevel for the welding of the header.

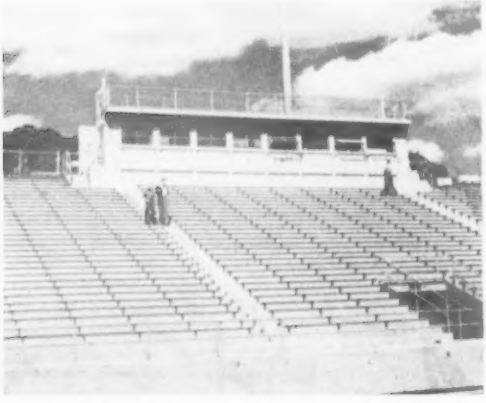
*Based in part on an article in the British publication, *Welding*.

1—COLUMNS ERECTED, the 16-in. WF 45-lb girders are bolted in place. Later, they will all be welded

2—BOLTING APRON and walkway into position for welding. Steel decking will also be bolted to girder

3—UNDERNEATH STAND during construction. Light streaks won't be visible after welding is completed

4—BUTT WELDS join ends of ¼-in. decking sections. Lap joints connect upper and lower sections together



5—PRESS BOX is made by welding standard steel panels. The guard rail around the roof is welded piping

6—FINISHED STADIUM (north structure) after several coats of gray paint. End walls are of masonry

Low-Cost Welded Stadium

Safety, comfort and permanance are benefits of welded steel grandstands made by Pittsburgh-Des Moines Steel Co. The almost unlimited flexibility of these stands allows schools to build today and plan for tomorrow.

BY R. G. SWISHER

RECENTLY completed "Memorial Stadium" project at Troy, O., consists of two all-welded steel-deck grandstands with a total seating capacity of 10,054 persons. The present installation provides permanence, safety, appearance and excellent seating comfort. Far more important, however, its unit construction adapts it to future expansion.

SECTIONAL CONSTRUCTION

The patented design of the Pittsburgh-Des Moines welded steel grandstand is like the well-known sectional bookcase: it requires a number of standard units. A standard section is 18 ft long by 10 rows (20 ft) deep. Aisles 3 ft wide are spaced 36 ft apart and extend from front to rear of the stand. The seating length of a bay is 18 ft less half the width of an aisle or 16 ft 6 in. Allowing 16½ in. for each seat, there are 12 seats per row per bay or 120 seats per bay. The seats, it should be noted, are wood planks supported by brackets that are securely welded to the deck.

Any number of 120-seat bays can be added to the rear or to the ends of the original stadium at any time. Special sections can be made to fit the corners and to utilize all available space.

The present 10,054-seat stadium consists of 45 standard units or bays on each side of the playing field. Each structure is 270 ft long and 60 ft deep. There is also a press box at the top center of the north structure. The press box measures 50 ft by 5 ft 8 in. and was constructed of standard welded steel panels.

The steel decking to which the seat brackets are welded is set at an angle to shed water. All of the joints are welded watertight: the space under the stands can be used for dressing rooms, toilets, storage concessions, etc., without showers from above. Entrance and exit are by means of ramps at the ends of the walkway and wells in the stands. Welded rails of 1½-in. pipe surround these wells and the entire stands. Masonry walls were built along the ends and back to complete the enclosure of the space under the stands.

The 500 tons of steel used on this job required 1½ tons of weld metal for the field welding of the two structures. Construction sequence is shown by the pictures on the facing page.*

In Fig. 1, the 8-in. WF 24-lb columns have been set on concrete footers. Workers are connecting the 16-in. WF 45-lb girders with bolts for temporary support. The number of bolts is kept to a minimum. The connection plates and connection angles were shop welded to the beams and girders before shipment. Numbered parts made for fast and easy erection.

A truck crane aided the field crew to position and erect the columns and girders. When all of the bolts had been drawn up tight, the connections were ready for welding. Fig. 2 shows workers bolting the apron and walkway into position for welding. This close-up reveals the shop-welded connections to the 16-in. WF 45-lb girders; these are for bolting the steel decking into position for welding. The angle plate supporting the apron is also shop welded to the girder.

The ¼-in. deck plates were lifted into position with the truck crane. Each section of steel decking is 18 ft long and consists of two formed steps. Deck plates were bolted into position and then welded with ¼-in. electrodes.

In Fig. 3, we see how the stand looked from underneath during construction. The light streaks between deck plates will be gone and the stand will be watertight when welding is finished. The 1-in. crossed bracing rods shown in this picture are used only in the alternate bays.

The weldors in Fig. 4 are making single-pass butt welds with ¼-in. electrodes to join the ends of the steel decking sections. The lap joints that connect the upper and lower steel deck sections have already been welded. The upper deck section overlaps the edge of the lower section, and there is a 1-in. fall from the rear of each step to the front. In welding the lap joints of the decking, the sections were welded in sequence and intermittent welds were made first to hold distortion to a minimum. The lap joints were finish welded section by section.

Flashing had to be arc welded to the exit and entrance wells to keep out drainage from the stands. First, intermittent welds were made to hold the flashing in place, and then the joint to the decking was welded solid with fillet welds. Around the entrance and the exit wall the weldors constructed a handrail of 1½-in. pipe. This same type of handrail was also built along the outer edge of the stand and along the walkway at the foot of the stand.

CONTINUOUS WELDING

Eight 300-amp gasoline-driven welders were kept busy in the construction of the stadium. They were supplied with gasoline for continuous operation by a 500-gallon drum on skids. A concrete "buggy" carried oxygen-acetylene cylinders to where they were needed for flame-cutting and trimming.

Fig. 5 gives an excellent view of the steel-panel, all-welded press box. Fully enclosed, the box has large viewing windows that can be opened during warm weather. The roof is encircled by a guardrail of welded pipe and can be used for television and newsreel photography.

Several coats of gray paint provide an attractive finish for the completed stadium, shown in Fig. 6. The south structure is the same design and size but lacks the press box.

In this manner, a school can build a permanent stadium section by section as money becomes available. The beauty of it is that nothing ever has to be torn down; none of the original investment is ever lost.

*Photos courtesy of Hobart Brothers Co.

WILLIAMS PAVING CO., Norfolk, Va., needed a garage for repair work—so Ed Williams had it made to his order

Welded Portable

This unique type of *trans*portable garage was built by a welding shop at Gettysburg, Pa. You can—

Put it up, tear it down in about three hours: that's all the time it takes to assemble or disassemble it.

Haul it from place to work on a truck as work on the road proceeds. It will be where you want it.

BY CHARLES W. HARBAUGH

ERNEST H. SIMPSON, owner of Simpson's Machine and Weld Shop, Gettysburg, Pa., recently contributed his talents to the construction of an unusual building. It all began when the telephone bell jingled in Ernie's small shop at the rear of 102 Carlisle Street.

Ernie lifted the receiver from its hook. "Simpson Machine Shop," he said to the mouthpiece. "Simpson speaking."

"Mr. Simpson, this is Ed Williams, of Williams Paving Co., Norfolk, Virginia. We're concreting an addition to the Pennsylvania Turnpike. I need a garage for road machinery and truck repairs. I haven't been able to rent one, so I want you to build it for me."

"But we're in the—"

"My men are already at work on the new addition from Harrisburg to Philadelphia. What I want is a building you can put up or tear down in a day and use over again. Some sort of framework you can load in a truck and haul from place to place. I need it quick."

"But this shop isn't very large, and—."

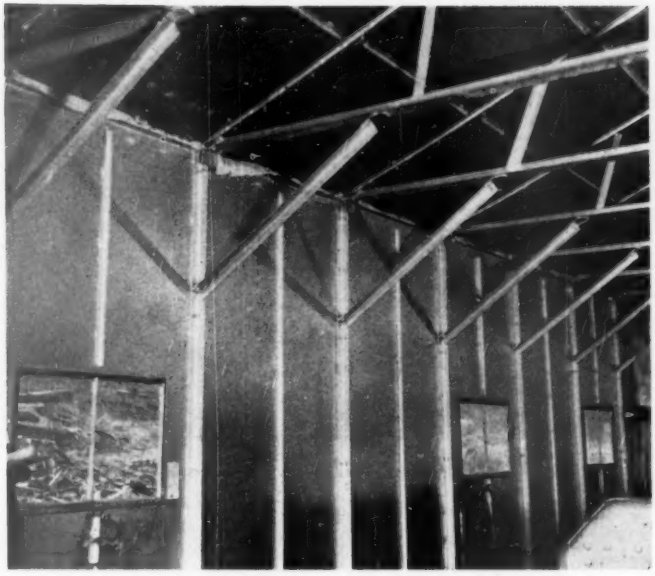
"Just tackle the job. You can do it. I'll be in Gettysburg next week to look over your plans."

The click of a receiver being replaced in its cradle ended the conversation before Ernie could offer any further objections. Well, why not build a portable garage, anyway? It might be fun to work the thing out.

For the following three days, he formulated his plans. An artistic employee, Robert W. Paris, made a rough sketch. Mr. Williams saw it and approved when he came to Gettysburg at the end of the week.

DONE IN THREE WEEKS

Three weeks later, the portable repair shop was finished. The equipment used in its construction included an arc welder, a drill press, a power saw and electric shears. Jigs to drill and square up the workpieces were made with the aforementioned machines from I-beams and angles. Supplies included sheet-metal panels, bolts, washers, nuts, hinges, angles, "two by four" timbers, glass and plywood. No part of the finished product weighed over a hundred pounds. This advantage made it possible for three men to assemble the building (or tear it down) in approximately three hours.



SIDE PANELS of sheet metal and roof trusses fit together as shown here

Repair Shop

FROM FRONT END, garage looked like this. Folding doors are of plywood

Eight sheet-metal panels formed each of the two sides of the structure. These 4 by 10 ft sections were drilled so that they could be interchanged with one another. Angles were welded to tops, bottoms and sides of the sheets to give them flanged edges. The men setting up the building had only to bolt the flanges together to fasten the side panels into place.

Nine trusses supported the roof. These were bolted to the tops of the side panels. Other angles were cut to make diagonal braces. Each of these 18 supports ran from the bottom truss member to the side piece angle. The trusses were locked into place by bolts along the flanged edges at the tops of side panels.

There were five end panels for the rear of the building, and these, also, were interchangeable with the panels at the sides. The front of the building was closed by hinged folding doors. Seven window panels were provided, and these sections could be changed about, too; the builder could rearrange his windows in any way at any time he chose to do so. A notched metal brace was welded to each window panel so that all of the windows could be opened at varying lengths. To remove a window, it was merely lifted from its hook.

For purposes of ventilation, several of the side and rear panels could be taken off or the folding front doors left open.

Roof Construction

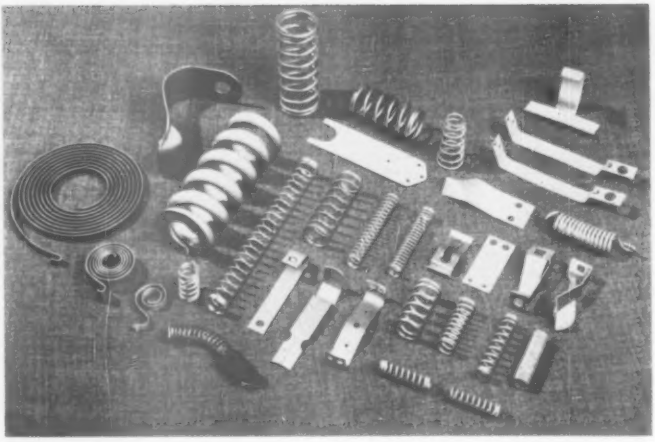
Roof panels were also sheet metal, each supported by four crossed angles to prevent sagging. These 4 by 11½ ft panels slide into channels at the tops of the trusses. Bolts are fastened between each two panels and through each truss. When the nuts beneath the trusses are tightened, the sheet-metal roofing is securely anchored between the bolt heads and trusses. Washers placed above the nuts safeguard against leakage. No holes had to be drilled in any roof panel.

An angle across the top of the roof completed the roof construction. It is held in place by lugs spaced at 4-ft intervals across the top of the roof. To complete the enclosure, two of the end trusses were welded to triangular metal sheets. The hinged folding doors were made from plywood sections bordered by frames of two-by-fours.

For a foundation, Ernie set the entire structure on (and bolted it to) the steel forms that are used in the cementing of roads. These forms can be easily leveled and then made immovable by steel stakes. An excellent flooring can be easily provided by dumping in and smoothing a load of crushed white stone.

Today, Mr. Williams has a practicable portable building that can be dismantled in about three hours by three men and hauled from place to place on a 1½-ton truck. Ernie has made a new friend and a profit.

BY JOHN T. RICHARDS
Design Engineer,
The Beryllium Corp., Reading, Pa.



BERYLLIUM-COPPER springs—flat, compression, power and brush types

Welding, Brazing, Soldering

High and low temperature silver brazing and resistance

If you are after such properties as high strength and hardness, good electrical and heat conductivity, excellent resistance to fatigue, wear and corrosion, maybe a beryllium-copper part is the answer. Now you will want to know how to join it to other pieces, either similar or dissimilar.

In a three-part study that is probably the most thorough ever made on this subject, Mr. Richards gives full details of the several methods for joining. Last month he discussed the hardness properties that are affected by high temperatures and went from there to soft soldering methods in the 400-600 F range.

For greater strength, higher temperatures must be employed, even though these may affect the heat-treated properties. This month, Mr. Richards tells you how to do silver brazing and resistance welding. His final article will take up the carbon-arc, metal-arc and inert-arc welding of beryllium copper.—THE EDITORS.

SILVER-BRAZING alloys are widely used for joining beryllium-copper components to each other or to dissimilar materials; their virtues are high strength, relatively low melting ranges, free-flowing characteristics, good resistance to corrosion. Compared to soft soldering, silver brazing offers superior corrosion resistance and joints of higher strength.

Unlike soft soldering, silver brazing should precede the final hardening: the brazing temperatures (1,145-1,475 F) are considerably above the aging range and will rapidly soften the workpiece. Beryllium copper so annealed, however, can be subsequently age hardened to approximately peak properties.

HIGH AND LOW TEMPERATURES

Two silver-brazing methods are commonly used:

No. 1, Low-Temperature: Torch brazing with a solder that flows at 1,145 F. Heat is confined to the joint area. Work is either air cooled or quenched, followed by age hardening at 600 F.

No. 2, High-Temperature: Brazing alloy used melts at 1,435 F. The parts are heated to 1,450 F so that the silver alloy will melt and flow through the joint area. The temperature is reduced to 1,400 F to solidify the silver solder, and the assembly is quenched in water. The quench is followed by the standard aging treatment at 600 F.

The first or low-temperature (1,145 F) procedure is generally recommended for joining parts of similar section and relatively small size. It is easier to control and gives good results if the heating times are short. Hardness readings immediately adjacent to the joint are within a few points of the maximum heat-treated hardness. A typical low-melting alloy has 45% silver (balance cadmium, zinc and copper).

The second or high-temperature (1,435 F) procedure is for furnace brazing and other long-cycle work. Use this method if parts of large size or dissimilar section are involved. If you tried the low-temperature method for dissimilar sections, the time required to bring a heavy part to temperature would probably be sufficient to soften and minimize subsequent hardening in a light part. When such size discrepancies exist, the combined brazing and solution-annealing treatment possible with the 1,435 F solder is needed to gain the peak hardness that follows aging.

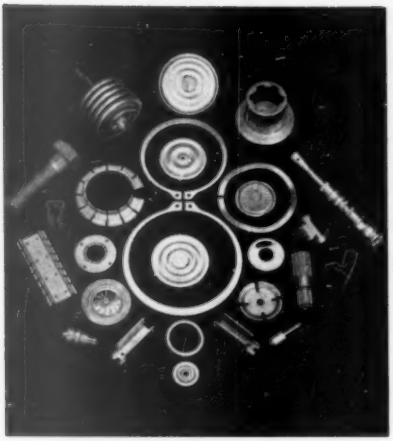
For high-temperature brazing of copper-base alloys, the silver-copper eutectic (72% Ag, 28% Cu) is recommended. This eutectic alloy melts and flows at 1,435 F. It is not recommended, however, for joining beryllium copper to steel.

As told in the previous article (THE WELDING ENGINEER, June, 1950), beryllium copper should be rapidly cooled (quenched) from the solution-annealing range to insure the proper hardness response during aging. Naturally, there is some danger of cracking when joints are quenched. This may be overcome by jigging.

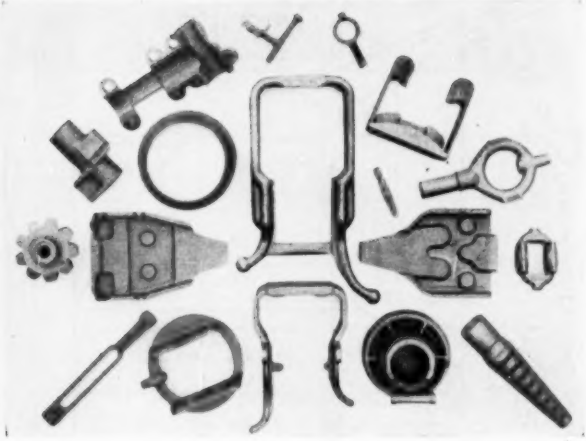
WHAT TYPES OF FLUXES

Self-fluxing hard solders containing phosphorus are not recommended since phosphorus does not flux beryllium oxide. It takes fluoride fluxes to dissolve the refractory beryllium oxide and make possible sound joints. Borax and boric acid fluxes are not fluid at lower brazing temperatures; hence are not protective. Nor will borax alone dissolve beryllium oxide: various combinations of borax, boric acid and alkali-bifluoride are required.

A low-melting fluoride flux of high



SAND-CAST PARTS for a variety of uses



PARTS CAST for assorted mechanical and electrical applications

Beryllium Copper—II

welding are covered this month. Mr. Richards gives you practical procedures

activity is recommended for either 1,145 F or 1,435 F brazing. This flux begins to fuse at about 1,050 F; at 1,100 F, it is a thin, chemically active fluid that dissolves oxides rapidly and thoroughly. Special fluxes are frequently required for: (1) joining beryllium copper with aluminum bronze and (2) when the heating time exceeds five minutes.

First step for any brazing method is to clean the surfaces thoroughly, removing all traces of oil, grease or scale. The flux is applied before heating, usually by brushing a thin film in paste form over the surfaces to be joined. The flux does three things: it prevents oxidation during heating, dissolves the oxides formed during brazing, helps the brazing alloy to flow out.

Torch Brazing

For best results in torch brazing, the parts should be heated as rapidly as possible with the heat concentrated in the area of the joint. The oxyacetylene torch is preferred as it gives rapid heating and minimum time at temperature. The recommended flux is completely fluid and active at 1,100 F. It is advisable, however, even when using an alloy that flows at 1,145 F, to superheat above this temperature to get as much of the oxide as possible dissolved at the time the brazing alloy flows. In critical applications, the parts may be immersed in water while they're brazed; this will "localize" the heat to the joint area.

The flow of alloy (and joint soundness) may be enhanced if you slide one part over the other while the brazing alloy is still molten. For example, in a "rod-in-sleeve" joint, rotate one part in the other for a half or even a whole turn.

Furnace Brazing

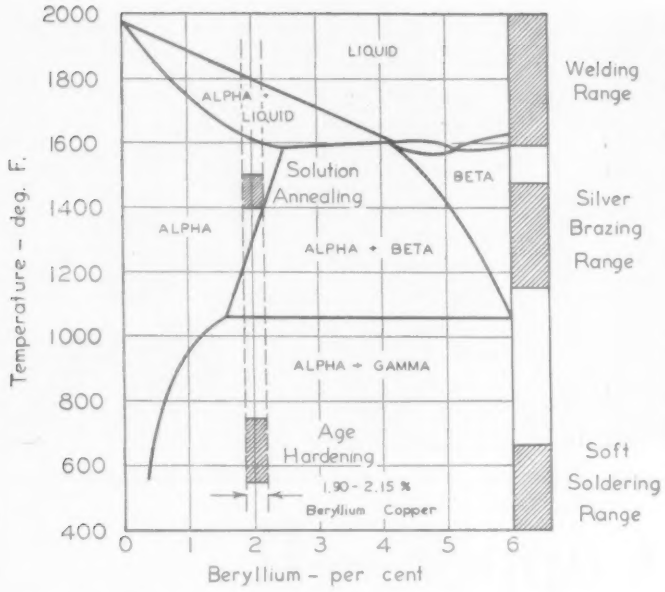
When a furnace is used, it should be brought to temperature before the work is charged. In furnace brazing, it is always advisable to have the brazing alloy the last part of the assembly to come up to temperature. Hence it should be concealed from the source of heat (by preplacing it inside the assembly). By the time the solder is ready to flow, the flux will have become active throughout the joint area; then the flow of alloy will displace the flux and produce sound joints.

The type of joint will generally depend upon design limitations. Lap joints should be used wherever possible as they offer the greatest strength. Electrical conductivity is usually not a factor, but silver solders have high conductivity.

Clearances in the range 0.001-0.003 in. permit the molten silver alloy to be drawn through by capillary action. This means good penetration, maximum strength and a saving in solder. Should the areas to be soldered require a penetration of more than 3/16 in. between overlapping surfaces, tin the surfaces separately with solder. The tinned parts should be quenched, cleaned, refluxed and assembled for the final joining operation. Another method of making lap joints calls for pressure instead of tinning. A thin sheet of solder is laid over the whole area, and pressure is applied at the right time to squeeze out the flux and excess solder.

How Heat Affects Hardness

Although heating in the silver-brazing range of 1,145-1,475 F rapidly anneals beryllium copper (particularly thin strip), the structure is not seriously disturbed. The brazed piece can be rehardened at 600 F to within 2-5 points of maximum hardness if the heating times were relatively short. The catch is in that little word "if."



1—WHAT HEAT does to beryllium copper. The equilibrium diagram tells how heating to the silver-brazing and welding ranges affects the hardness

The heating periods associated with furnace brazing are 4 to 5 minutes as compared to ¼ to 1 minute for torch brazing. These longer heating periods prevent complete hardness response during subsequent aging. In the range 1,400-1,475 F, heating not only melts the solder but solution anneals beryllium copper at the same time (if the part is immediately water quenched). This is shown by the equilibrium diagram (Fig. 1).

Table V summarizes work carried out by Hunt and Setapen and Warren on the effects of low-temperature (1,145 F) silver brazing on the hardness of beryllium-copper strip. Various strip thicknesses and tempers were considered. The following conclusions can be drawn from this excellent piece of research:

(1) Brazing temperatures have greater effect upon thin than upon thick strip. This means that in thin strips it's difficult to obtain maximum hardness close to the joint. Considerable care is required in handling strip thinner than 0.020 in. to insure proper aging.

(2) Quenching helps by limiting heating times. Where it is permissible, assemblies should be water quenched.

(3) Normal aging times and temperatures will give approximately peak hardness following low-temperature brazing.

Either high or low temperature silver brazing can be depended upon to give good results with beryllium copper. Service tests indicate that operating temperatures for silver alloys should not exceed 400 F for prolonged periods; short-time tests at 600 F show a 50% loss from strength at room temperature. Joint strengths of up to 90,000 psi (approximately the proportional limit of beryllium copper) have been obtained on brazed and age-hardened butt joints.

If the strength is low, it's usually caused by (1) insufficient surface preparation, (2) entrapped flux, (3) failure of alloy to completely penetrate the joint. I can't stress too strongly the need for proper initial cleaning of the joint area.

Gas Fusion, Brazing

Gas-fusion welding with an oxy-acetylene flame is not used for joining beryllium copper because no practical method has been developed for fluxing the beryllium oxide. That tough oxide film prevents the weld metal from flowing to the base metal.

No satisfactory method has been devised for bronze welding (brazing). The flow points of the copper brazing alloys generally used are too high for beryllium copper, which melts at 1,585-1,750 F (see Fig. 1).

Here are the melting ranges of several copper-brazing materials:

Bronze welding rod
(58% Cu, 42% Zn) ..... 1,595-1,625 F
Spelter brazing solder
(50% Cu, 50% Zn) ..... 1,595-1,620 F
Phosphorus-copper
(93% Cu, 7% P) ..... 1,300-1,525 F

Since the working range for these materials is 50-100 F higher than their melting points, it is obvious that incipient fusion may occur in the base metal. In the case of eutectic phosphorus-copper (93% Cu, 7% P), a self-fluxing solder, the phosphorus does not reduce beryllium oxide.

Resistance Welding

Beryllium copper may be readily joined by spot, seam or flash-butt welding. Parts can be resistance welded to other beryllium-copper parts or to dissimilar metals.

In resistance welding, the weldability of a metal is approximately inversely proportional to its conductivity. Beryllium copper is, therefore, more difficult to handle than mild steel or silicon bronze. It compares favorably with phosphor bronze or cartridge brass, however, and is easier to work with than red brass or copper. As compared to mild steel of the same thickness, beryllium copper requires secondary currents approximately 50% higher, shorter welding times and somewhat lighter electrode pressures.

The combined effects of electrical and heat conductivity have a greater influence upon weldability than any inherent difficulty in getting the metal to flow together. High electrical conductivity means low heat for a given power input, while high heat conductivity gets the heat rapidly away from the joint area. The heat loss can be minimized, however, by using high welding currents for relatively short times.

Because of heat conductivity, some loss of strength must be expected adjacent to the weld; consequently, resistance welding may not be practicable for certain applications. On the credit side, however, beryllium copper is one of the few alloys in which part of the original strength

Table V. Effect of Low-Temperature Silver Brazing on Hardness of Beryllium-Copper Strip

Condition	Strip Thickness, Inches	Distance from Joint: ⅛ in.		¼ in.		½ in.		1 in.	
		Brinell	Rockwell	Brinell	Rockwell	Brinell	Rockwell	Brinell	Rockwell
1. Cold-rolled 2 nos. hard	0.010	172	B87	172	B87	172	B87	172	B87
Torch brazed and air cooled		132	B73	187	B90	205	B94	210	B95
Aged—1 hr @ 600 F		283	C30	313	C34	362	C39	372	C40
Aged—2 hr @ 600 F		290	C31	313	C34	372	C40	372	C40
Aged—3 hr @ 600 F		290	C31	332	C36	372	C40	372	C40
Original strip—aged 2 hr @ 600 F		372	C40	372	C40	372	C40	372	C40
2. Solution-annealed	0.020			103	B57	103	B57	103	B57
Torch brazed and air cooled				121	B68	111	B63	119	B67
Aged 2 hr @ 600 F				342	C37	350	C38	350	C38
Original strip—aged 3 hr @ 600 F				360	C39	360	C39	360	C39
3. Solution-annealed	0.020			103	B57	103	B57	103	B57
Torch brazed and quenched				111	B63	115	B65	111	B63
Aged 2 hr @ 600 F				355	C38	355	C38	355	C38
Original strip—aged 3 hr @ 600 F				360	C39	360	C39	360	C39
4. Cold-rolled 1 no. hard	0.020	152	B81	152	B81	152	B81	152	B81
Torch brazed and air cooled		135	B74	142	B77	152	B81	152	B81
Aged 1 hr @ 600 F		367	C40	377	C41	377	C41	388	C42
Aged 2 hr @ 600 F		388	C42	388	C42	388	C42	404	C43
Aged 3 hr @ 600 F		388	C42	388	C42	388	C42	404	C43
Original strip—aged 2 hr @ 600 F		404	C43	404	C43	404	C43	404	C43
5. Cold-rolled 4 nos. hard	0.020			216	B96	216	B96	216	B96
Torch brazed and air cooled				201	B93	220	B97	201	B93
Aged 2 hr @ 600 F				332	C36	346	C37	360	C39
Original strip—aged 2 hr @ 600 F				365	C39	365	C39	365	C39
6. Cold-rolled 4 nos. hard	0.020			216	B96	216	B96	216	B96
Torch brazed and quenched				170	B86	205	B94	234	B99
Aged 2 hr @ 600 F				311	C34	311	C34	365	C39
Original strip—aged 2 hr @ 600 F				365	C39	365	C39	365	C39
7. Cold-rolled 2 nos. hard	0.050	192	B91	192	B91	192	B91	192	B91
Torch brazed and air cooled		142	B77	172	B87	175	B88	192	B91
Aged 1 hr @ 600 F		367	C40	367	C40	388	C42	404	C43
Aged 2 hr @ 600 F		388	C42	367	C40	377	C41	404	C43
Aged 3 hr @ 600 F		388	C42	404	C43	404	C43	415	C44
Original strip—aged 2 hr @ 600 F		415	C44	415	C44	415	C44	415	C44

may be restored through age hardening. The strain-hardening alloys are permanently annealed (softened) during resistance welding.

It is necessary to distinguish between the heat-treatable condition (annealed or cold-worked tempers) and heat-treated condition (hardened from annealed or cold-worked tempers). Beryllium copper can be resistance welded in either condition. Similarly, the assembly may be annealed and heat-treated after welding or simply given the precipitation treatment. Although entailing fewer steps, aging without the first annealing gives lower final properties.

Prior to hardening, the electrical conductivity of beryllium copper is relatively low (12-18%). For best results, therefore, resistance welding should be carried out on material in the unhardened condition, followed by annealing and hardening.

RWMA Class 2 electrodes are recommended for the resistance welding of beryllium copper, but Class 1 materials are suitable for certain applications. The relatively high conductivity of beryllium copper requires electrodes having an electrical conductivity of at least 75% I. A. C. S. Use dome (spherical-radius) welding faces since they are easy to clean and align. And make adequate provision for water cooling; it reduces marking or sticking of the work to the electrodes.

Before attempting to weld, you should first thoroughly clean the parts. Make sure that they are free from dirt, grease, oil and oxide scale. Welding schedules should be carefully established. The force between electrodes is more critical (and generally less) than required for steel. If the pressure is too low, porosity will be excessive in the weld nugget; if too high, sheet distortion or indentation will be objectionable.

Weld time should be somewhat less than for mild steel; it is, as a matter of fact, about the same as the time required to weld stainless steel. Current requirements exceed mild-steel values; hence welders of low capacity may give trouble. Electronic synchronous timing controls are recommended to maintain close control over the short weld-time periods. Electrode pressure should be applied by means of some low-inertia arrangement to give a quick follow-up as the weld metal melts.

Electrical contacts are frequently attached to beryllium-copper flat springs by resistance welding. Generally, the contact is of precious metal, provided with a backing of steel, nickel or Monel; the weld is made between the backing material and the beryllium copper.

Flash-butt welding offers a satisfactory method for joining wire, rod, bar and strip where variables such as current, time and pressure can be controlled. Seam welding gives good

(*Please turn to page* 56)

How Safe Are You?

Check these suggestions for personal safety and comfort. They are regular work habits for most good welding and cutting operators

BY PHIL GLANZER

GROW CARELESS, and you leave yourself wide open to accidents. Check your normal work habits against these ten suggestions. Your score should be 100—10 points for each. What is it?

1—WHAT DO YOU WEAR?

Wearing improper clothing is one of the commonest forms of carelessness among weldors. The clothes you wear at work should be free of oil and grease. Watch out also for frayed edges and tears or patches where sparks can lodge and start burning.

Woolen clothing will not catch fire as easily as cotton. A fabric with a hard, smooth surface is better than one with a nap. Woolens also give greater protection against heat.

2—WATCH TROUSER CUFFS

Do you roll down your sleeves and turn down your trouser cuffs before you start a welding or cutting job? This precaution is particularly important when cutting is to be done. Flying sparks or hot slag can easily lodge in a trouser cuff. Before you're aware of it, your clothes may catch fire and give you a painful burn. For the same reason, button flaps on breast pockets of your shirt. Some operators wear a light leather apron to protect their knees, thighs and waist.

3—WEAR HIGH SHOES

A "hot foot" is never very funny. Wear high shoes that will keep out hot metal or slag. If you must wear low shoes, fix your trouser legs so they cover your shoe tops; that'll help to keep slag out.

4—GAUNTLETS PREFERRED

A good pair of asbestos, leather, or fireproof fabric gloves will save a lot of grief. If they're of the gauntlet type, so much the better. Gauntlets not only ward off sparks, but also protect your hands and lower forearms from heat.

5—GOGGLES FOR EYES

Whenever you weld or cut (or watch such work), protect your eyes from sparks and glare. Wear a pair of good, well-fitting goggles, or a helmet with the right shade of lens if you are doing arc welding. Correct goggle lenses are made of specially colored optical glass. In general, the light shade is for cutting; the medium shade for average run-of-shop welding; the dark shade for heavy welding.

Good goggles are lightweight, well ventilated and fit comfortably to the contour of the face. Best frame materials are tough fiber, hard rubber and plastic.

6—ADDED SAFEGUARDS

If you prop a piece of sheet metal against the work table, it will stop sparks and hot metal from getting to your feet and ankles. A pan of water or sand placed directly beneath a cut will prevent sparks and slag from lodging where they can start a smoldering fire after you've finished the job.

7—CAREFUL WITH OXYGEN

Using oxygen to blow dust and dirt from clothing or work is bad practice. Oxygen itself doesn't burn, but it can easily cause a spark or hot particle lodged in a fold of the clothing to flare up violently and set off the garment in a burst of flame. Likewise, a stream of pure oxygen under pressure may cause oil or grease (on clothing or on work) to ignite.

8—TONGS FOR HOT METAL

Keep a pair of blacksmith's tongs handy to handle hot pieces. Metals that cool enough to have lost their red color, may still retain enough heat to burn the fingers badly—even if gloves are worn.

ROLL DOWN your sleeves to protect your arms from heat, sparks and particles of molten metal

TURN DOWN your trouser cuffs so that there will be no place for slag and flying sparks to lodge

WEAR GAUNTLET gloves of fireproofed leather or of asbestos to guard hands, wrists, forearms

9—WATCH FALLING SCRAP

Remember the story of the foolish fellow who climbed out on a limb and sawed himself off? Every once in a while, a careless cutting operator will trim a steel plate or part so that the scrap piece falls on his foot. Think about where a piece will fall before you cut it.

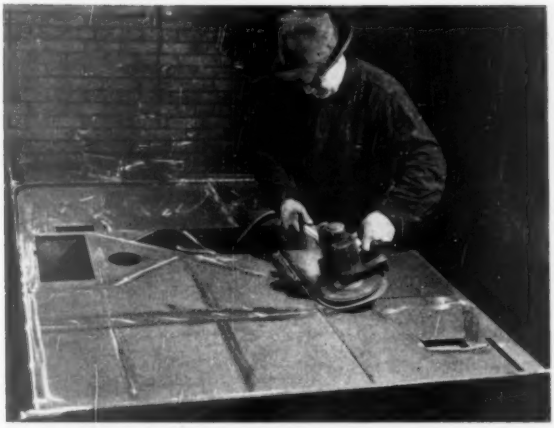
10—PUT FLAME OUT

Never lay your torch down with the flame lighted. While adjusting work, regulators or clothing, you (or your helper) might brush against the flame. Even if you don't touch it, the mere weight of the hose may cause the torch to shift. In either event, the result might be a burn that you could have avoided.

Faster Ways of Grinding

BY GENE K. JORDAN

IMPROVED methods of grinding off weld beads have brought increased production to two firms recently visited in the Minneapolis-St. Paul area.



1—GRINDING OFF weld beads from sides of bandsaw housings

2—SAME DISC smooths edge seams on the bandsaw base stands

3—ABRASIVE BELT grinds off beads from conveyor rollers

1. Disc Grinding

AT BUTLER MFG. CO., Minneapolis, the switch from double discs to a single type of abrasive disc has meant faster grinding in the manufacture of bandsaw base stands and housings. These products are fabricated of 10-gage and 3/16-in. cold-rolled pickled steel, and the welded seams must be ground smooth.

Butler originally required double-disc grinding, necessitating two different grit sequences to complete the same weld-removing job. Now one wheel is used—a grit-36, resin-bonded fiber disc. The change has upped production from three units to five and a half units a day, according to Aaron Niedorf, the firm's methods engineer.

Worker morale has also increased as a result. Since the changeover in February, none of the discs have torn or cracked. About 75 discs are used daily, and 12 to 15 minutes grinding life is being obtained from each.

Weld beads are removed from the sides of bandsaw housings (Fig. 1) with grit-36 discs operated at 4,300 rpm on a hand-held pneumatic grinder. The same portable grinder and abrasive discs also smooth arc-welded edge seams on the bandsaw base stands (Fig. 2).

2. Belt Grinding

ANOTHER firm, the Standard Conveyor Co., North St. Paul, doubled its production rate by using a high-speed back-up roll with an abrasive belt on a backstand machine (Fig. 3). The back-up roll is a heavy-duty contact wheel, and the belt is a grit-36 cloth belt.

Says P. C. Wego, factory manager:

"The job is to grind off arc welds 16 in. or so long from hot-rolled carbon-steel rollers. The beads run 1/16 to 3/32 in. high and must be ground flush with the surface of the tapered rollers."

The rollers are used on curves in roller conveyor systems. They vary in length and gage, depending on the requirements of the conveyor system, from 14 to 24 in. long and from 10 to 18 gage. The 14-gage, 16-in. rollers are the most common.

Photos courtesy Minnesota Mining and Mfg. Co.

COVER PLATES OFF: Note the studs around outside of frame and on the tie bars running from side to side

Courtesy Nelson Stud Welding, Div. of Morton Gregory Corp.

COVER PLATES ON: Product is a 68-ft-long countercurrent solvent extractor made for a chemical company

Solvent Extractor Stud Welded

Welding 2,500 threaded studs to frame members eliminated time-consuming drilling and tapping.

EXTENSIVE use of modern welding techniques is enabling The Vulcan Copper & Supply Co., Cincinnati, to bring the cost of its Kennedy solvent extractor within the economical reach of oil processors. A recently manufactured extractor for a large chemical company was fabricated from stainless steel, required to prevent contamination of the raw material. The use of stud welding sharply reduced the amount of expensive stainless steel needed, and it didn't cut down any on the strength of the finished product.

In earlier designs, bosses or flanges had to be welded to the frame to obtain sufficient tapping depth for the studs. Stud welding did away with all of this material, and it eliminated the drilling and tapping that would have been required for the 2,500 studs used on the frame. Drilling and tapping operations would have been especially costly in view of the size of the machine elements and the difficulty of tapping stainless steels.

The finished extractor is 68 ft long, 8 ft wide and 6 ft high; it weighs about 18 tons. The entire structure has a liquid- and vapor-tight construction. A variable-speed drive and individual worm gears power the fifteen extraction sections.

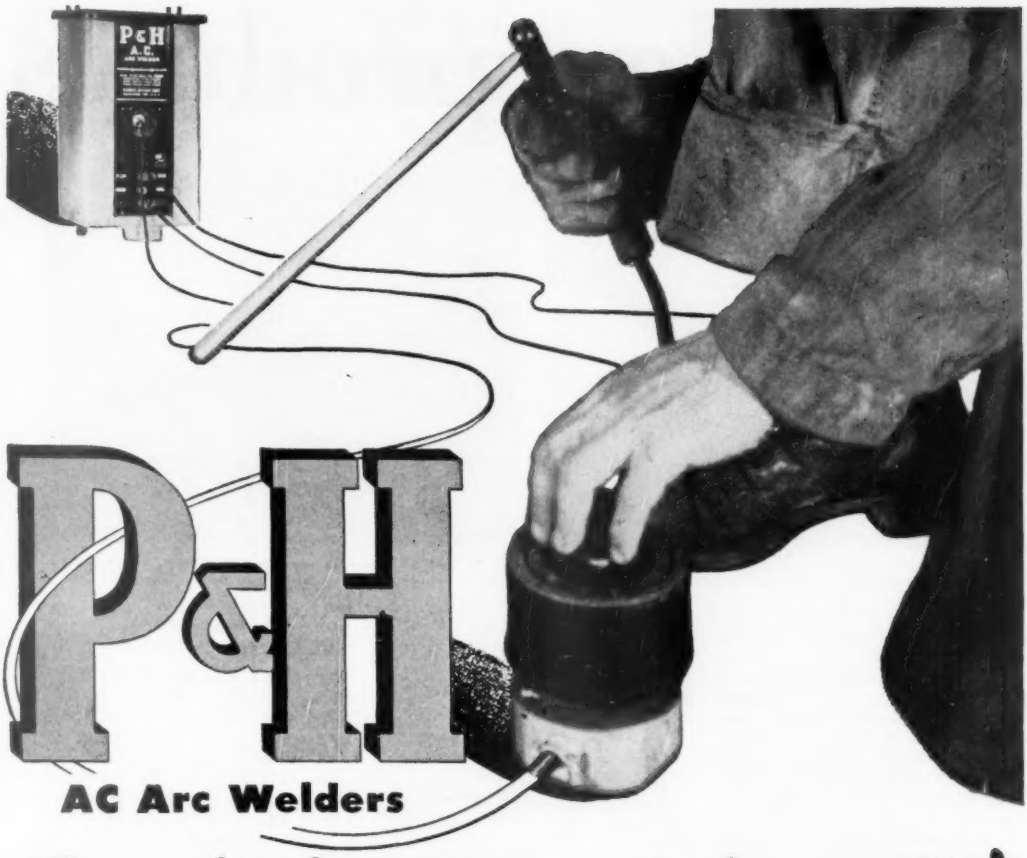
Stud welding was used at five different points in the fabrication. After the location of a stud had been marked by a center punch, the welding operator chucked the stud and protective ceramic ferrule in a portable stud-welding gun. He then placed the point of the stud in the center-punch mark and pulled the trigger. The welding power was supplied by a 400-amp (NEMA rated) d-c welding generator, used in the plant for other welding jobs. Long welding cable permitted the operator to make a great many welds without moving the generator or control equipment.

Studs used around the sides of the extractor were ½ by 1 in.; those end welded to the frame tie bars were ½ by 1½ in. Cover plates were drilled for the studs and fastened in place with nuts. The liquid and vapor seal along the top of the unit was completed by gaskets mounted on the tie bars.

Sight glasses and sampling ports, located along both sides of the extractor, are of quick-opening design to give easy access to the interior. Wing-nuts threaded onto studs hold the covers for these openings in place. Three ⅜ by 2 in. studs are at each opening. A small template was used to determine their positions.

Individual gear-reduction units drive the agitator paddles. Bearing housings for them were secured to the extractor frame by eight ½ by 2½ in. stainless studs for each housing. A total of 240 studs were required. Covers for the individual gear units were also fastened to the extractor frame by studs. Three ¼ by 1 in. stainless studs were welded in place for each cover.

Stud welding was likewise important in the fabrication of the fifteen stainless-steel impeller wheels. First, the stainless slats were spot welded to the wheel tie bars; the bars were then fastened to the wheel frame by studs welded to the frame members.



Turn the heat on – at the work!

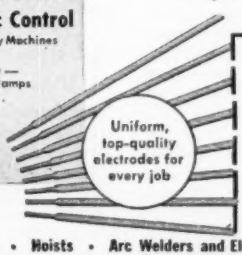
Exclusive Dial-lectric control saves time and motion, cuts your welding costs

P&H built-in remote control puts heat selection just where your operators want it — at the work. Walking time is turned into welding time. Mount the welder on the wall—save valuable floor space. Welding is faster, sounder, better looking. Production goes up, costs go down.

Additional features are: Easy quick-start arc. Elimination of arc blow. No moving parts to cause delays or maintenance expense. High electrical efficiency that reduces power costs. NEMA rated.

See your P&H representative or distributor for full details.

Model TH-500 — Range 40 to 650 amps
Model TH-300 — Range 30 to 400 amps
The only Complete Line of AC Welders with Dial-lectric Control
Also complete line of High-Frequency Machines
Model TI-200 — Range 30 to 275 amps
Model TI-150 — Range 20 to 190 amps



TEAR OUT THIS COUPON AND MAIL TODAY

P&H WELDING DIVISION
4513 W. National Ave.
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION

Please send me additional information showing how P&H AC welders cut welding costs.

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Excavators • Overhead Cranes • Hoists • Arc Welders and Electrodes • Soil Stabilizer • Crawler and Truck Cranes • Diesel Engines Cane Loaders • Pre-assembled Homes

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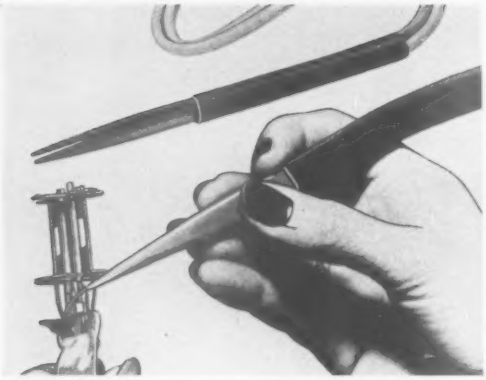
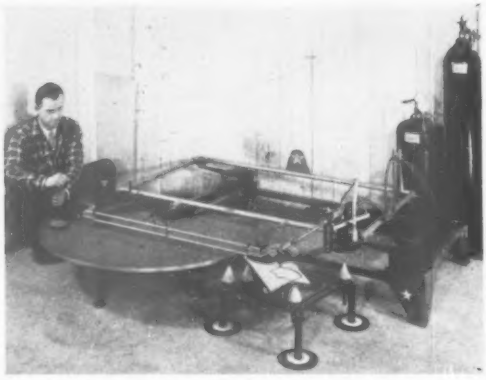


TWEEZER shaped resistance welding tool joins wires, small metal parts, connections in tubes, etc. Current comes from condenser power units



HAND TORCH clamped on new pantograph-type machine makes an efficient cutting outfit. Two models have 11 or 34-in. table height

R-W Tweezers Weld Filaments

THREE small resistance welding tools utilize the tweezer, pencil and plier principles to join filaments and wires. Metals that may be welded include mild steel, stainless, nichrome, nickle, phosphor bronze, copper, thermostatic bimetal, kovar, palladium, silver and tungsten. Applications are in radio tubes, switches, thermostats, instruments, etc.

Welding current is supplied from condenser power units, available in 100, 200 and 250 microfarad sizes, or larger. Power units operate off 110 volt house circuits or 250 volt power sources. A small knob on the front of the condenser panel sets the proper amount of welding current.

A small bench welder is also available. Its tweezer-type electrodes are mounted on the same case as the condensers.

FEDERAL TOOL ENGINEERING, INC., 532 Mulberry St., Newark 5, N. J.

* * *

Goggle Cleaner Also Kills Germs

A NEW cleaning solution for welding goggles and lenses is said to remove dirt and kill germs, also to act as a deodorant in certain cases. Called No. 101 germicidal detergent, the solution is neither a primary or secondary irritant, say company officials, but is a better sanitizing agent than coal tars, cresol compounds or formaldehyde.

Concentrated solution comes in either gallon containers or 2 oz. bottles packed 10 to a carton. A gallon makes 64 gallons of cleaning solution.

THE AMERICAN OPTICAL CO., Southbridge, Mass.

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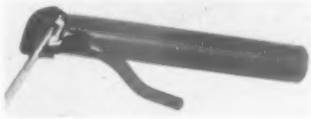


New Lincoln Holder Combines Tong and Hole

A NEW insulated electrode holder called the Lincoln LJ-1 has a strong "lock-jaw" grip that is released by easy thumb pressure. Tip of the jaw end of the holder is covered with a flexible temperature-resistant asbestos base compound. Lincoln claims the tip will not break if dropped and that it will resist the abrasion of rubbing against metal. The electrode is held close to the tip's end so that the holder can be worked in close quarters without grounding.

The lever-type jaw that grips the electrode is loaded with 50% additional spring capacity. The release handle, however, gives a high degree of leverage to allow the jaw to open easily. The cam jaw, at one side of the holder, gives a position 20 deg off vertical for downhand welding and a position 30 deg off horizontal for overhead welding. The hole takes 18-in. "center-grip" electrodes.

THE LINCOLN ELECTRIC CO., Cleveland 1, O.

Low-Cost Shape-Cutting with Pantograph Holder

WITH a new pantagraph type shape-cutting machine, home-made templates and a hand torch can be utilized to cut circles, rings, squares, etc. You can make the templates with a piece of light metal and tin snips. Circles may be cut up to 24-in. diam and straight lines up to 52 in.

A special stand for holding the workpiece is adjustable for thicknesses of steel up to 2-in. This is accomplished by using removable washers under cast iron support cones.

The tubular frame rotates upon thrust bearings in the revolving arms, which in turn swing on ball bearings. This assures smooth, firm movement in all directions.

Two models of the machine vary table heights. Model A occupies a floor space of 7 by 9 ft. and the top of the operating table is 34 in. from the floor. With model B, the table is only 11 in. high.

KROHN MFG. & SUPPLY CO., Centreville, Mich.

* * *

New Hard-Facing Alloy for High-Stress Abrasion

NEW hard-facing alloy is said to maintain high hardness at temperatures up to 800 F. It will also resist high-stress abrasion with medium impact. It is made of chromium, molybdenum, carbon and iron.

AIR REDUCTION SALES CO., 60 East 42nd St., New York City 17.

for welding

Your manual cutting torch fitted to a new pantograph machine described below will make an efficient shape cutter. Also, take a look at three new a-c welders and a new lightweight electrode holder.

British Firm Brings Out Aluminum Stud Welder

HIGH quality welds of aluminum studs to aluminum plate are said to be achieved with the British-made Cyc-Arc stud welding gun. No flux or shielding gas are used, though a ceramic ferrule is necessary for most diameters of studs.

Equipment includes a weld timer, welding gun, and a d-c source, either a suitable welder or a low voltage bus-bar. Straight polarity has worked best in tests. The timer is designed to operate from 200/240 volt, 50 cycle single-phase supply.

For general applications, the company advises keeping the aluminum stud diameter below twice the plate thickness for best weld strength and penetration qualities.

CYC-ARC, LTD., Stelmar House, 27 New North Rd., London, N. I., England.

* * *

Hobart Has New Line of A-C Transformer Welders

NEW Hobart a-c transformer welders feature current setting by an electrically adjusted reactor. Control of the five main ranges of welding current is by a hand-wheel switch. Above this wheel is the rheostat control knob, which gives 100 current settings in each main range.

Welding current is adjusted by a rectified d-c current that changes the relationship between the d-c flux and the a-c flux in the reactor core. The rectified d-c regulates this relationship at the instant of arc striking so that a higher-than-normal current exists for an instant to make it easier to strike an arc.

By connecting the rheostat through a standard plug and receptacle, remote control is possible. The rheostat can be removed and used at a distance.

Model TSP-205-C with power factor correction is rated 200 amp at 30 volts. Model TSP-182-C with power factor correction and limited input for operation on REA lines is rated 180 amp at 25 volts. Model TSP-205-C is designed to operate on single-phase 60 cycles, either 220/440 dual voltage or 550 volts. Model TSP-182-C is designed to operate on single-phase, 60 cycles, 230 volts to comply with the REA specifications for welders.

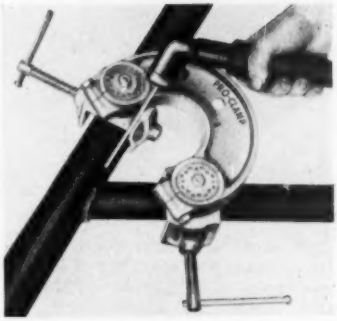
HOBART BROTHERS CO., Troy, O.

* * *

Wheel Assemblies for Job Welding Shops

THE job shop that makes trailers will welcome these new utility axle-and-wheel assemblies, which have a load capacity of 4,000 lb. Each assembly includes a 1½-in. solid square bar axle, five stud hubs of malleable steel (two tapered roller bearings in each hub) and two 15- or 16-in. demountable disc-type wheels. Tread width is 59 in., adequate for most boat, paint, horse and utility trailers, spray wagons, etc. Wider or narrower widths are also available.

STANDARD EQUIPMENT CO., Cedar Rapids, Iowa.



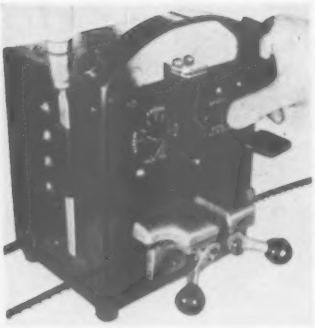
Protractor Clamp Holds Tubing and Angles

JAWS of the new Bernard Model "B" Pro-Clamp will hold up to 2½-in. pipe or angle bar. One face of each of the two rotating clamps has a V-form for fitting it to round, oval or angled surfaces. The pressure screws may be shifted from one side of these clamps to the other so that either clamp face can be next to the work.

Clamps are rotatable in the "U-frame" through a full 360 deg; each clamp has a double 180-deg machine protractor scale. Total weight is 11¾ lb.

BERNARD WELDING EQUIPMENT CO., 741 East 71st St., Chicago 19.

ALMOST ENTIRE absorption of infra red and ultra-violet rays present in arc welding is claimed for new welding lenses. They are accurately graded for density of shade and thickness. Standard size is 2 by 4¼ in. with a 4½ in. length also available. General Scientific Equipment Co., 2700 West Huntingdon St., Philadelphia 32



Band-Saw Blades Welded with Portable Butt Welder

NEW small butt-welder does on-the-spot welding and annealing of band-saw blades up to ½ in. in width. For fast repair, the welder may be mounted on the side of the bandsaw itself. Its dimensions are 7 by 8 by 10¾ in.

All controls, including welding and annealing, are clearly marked. For accessory equipment, a blade squaring shear and etching pencil are available. The etcher offers a simple way to mark tools, dies, etc.

THE DOALL COMPANY, Des Plaines, Ill.

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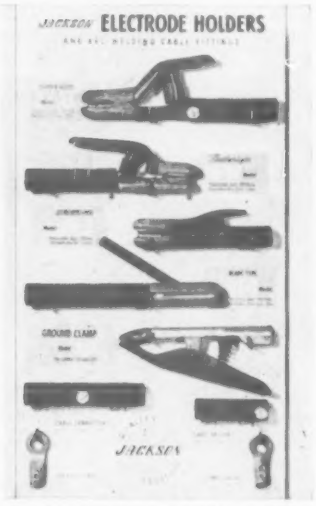

DISPLAY boards offered by Jackson Products, Warren, Mich., to its dealers and distributors. Boards are ¼ in. hardboard with stout wire hooks and hinged metal easels

* * *

A-C/D-C Coatings Made for Stoody Hard-Facing

SEVERAL former d-c hard-facing electrodes in the Stoody line now have a-c/d-c coatings. These do not replace the older d-c types but are additions. To differentiate between the two types, the new rods are preceded by the term "AC-DC."

The new coatings have a graphite-type base which eliminates slag interference and produces a stable arc. Members of the "AC-DC" line are:

AC-DC Stoodite, with Rockwell C hardness of 56, high resistance to abrasion, galling and pitting.

AC-DC Tube Borium, with all the characteristics of the standard d-c electrode.

AC-DC Borod, similar to the Tube Borium, but with finer borium particles.

STOODY CO., 11934 East Slauson Ave., Whittier, Calif.

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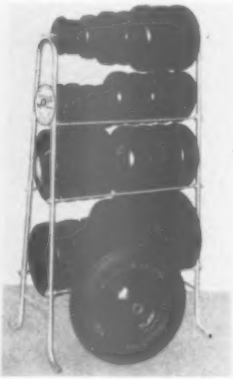

Wheel Display Stand Offered to Jobbers

DESIGNED in four tiers, a new steel display stand for rubber-tired industrial wheels is offered to help the dealer in sales efforts. It provides for an axle on which several sizes of wheels can be mounted for spinning and examination. The stand is 44 in. high and takes up two sq ft of floor space.

NEILSON WHEEL CO., 1614 North 12th St., Milwaukee, Wis.

* * *

New E6012 Electrode Put Out by Lincoln

RECOMMENDED for high speed production of single pass fillet and lap welds in the horizontal position, Lincoln's new "Fleetweld 72" is said to have a high melt-off rate, excellent arc characteristics and nearly flat bead.

Best operation with the new a-c/d-c electrode, says Lincoln, comes with slightly higher currents than other brand E6012 electrodes.

It is available in 14 and 18 in. lengths in diameters ranging from ⅛ to 5/16 in.

THE LINCOLN ELECTRIC CO., Cleveland 1.

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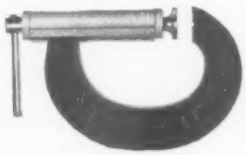


Steel Shield Protects Clamp from Spatter

NEW line of Jorgensen weldor's clamps, Style No. 120-S, features a steel shield over the full length of the clamp screw to protect it from spatter. Shield carries no load. Clamps come in openings ranging from 2 to 12 in. with load limits from 2,400 to 4,500 lb.

ADJUSTABLE CLAMP CO., 426 North Ashland Ave., Chicago 22.

NEW PRODUCT BRIEFS

High remelt temperature of 1,850 deg. F. is claimed or "Eutecrod 1807," new silver brazing alloy. Higher conductivity also results from joints brazed with the new formula, according to the makers, Eutectic Welding Alloy Corp., 40 Worth St., New York City 13.

* * *

Spring-wound chain is handy to fasten torch lighters, tip cleaners, etc., to the weldor's belt. A pull on the lighter brings the "Jiffy-Bak" chain out to usable length. When dropped, the spring automatically winds up to the belt again. MAST-R-KRAFT ENGINEERING & SALES CO., Box 283, San Diego 5, Calif.

* * *

Cold metal solder can be applied over large surfaces because it doesn't pick up on the backswipe. After being sanded to a smooth finish, it is claimed not to crack or shrink. SWISS LABORATORY, 1533 Hamilton Ave., Cleveland 14.

* * *

Self-pressurizing fuel for soldering and brazing torches is packed in a seamless, throw-away "beer can" container. "Prepo" fuel is claimed to have superior safety qualities under all conditions. PRESSURE PRODUCTS CORP., 140 North Dearborn St., Chicago 2.

Silicone-Insulated Welders Resist Heat and Wear

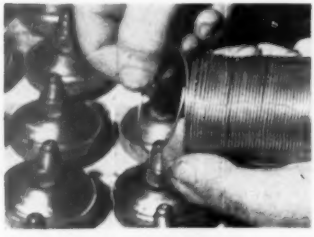
NEW G-E portable a-c welder features silicone-impregnated coil insulation. Silicones are synthetic resins resistant to high temperature: they are said to maintain electrical and mechanical strength at temperatures where ordinary varnishes char and disintegrate. The windings have been rated at the conservative temperature rise of 130 C. In addition, they are well ventilated to operate at uniform temperatures.

The welder, inaugurating the 6WK20H series, is rated at 30-250 amp. It is equipped with "hot-start" control—composed of a gas-filled time-delay magnetic switch and a wound resistor. The control causes a surge of current just as the arc is struck; the surge is much higher at low current settings, ordinarily more difficult to start.

Welding range is covered by three overlapping current ranges. Insulated tapered plug connectors give a quick selection of ranges.

THE GENERAL ELECTRIC CO., Schenectady 5, N. Y.

* * *



Silver-Brazing Rings Notched for Efficiency

NEW silver-brazing coil rings have notched coils and are stress relieved during manufacture. These features are said to improve brazing quality while reducing material cost, assembly time and number of rejects.

Stress relieving of the rings prevents them from creeping or otherwise distorting under brazing heat. The notched coil reduces assembly time by 10%. Novel stacking eliminates the average 10% breakage allowed for conventional preforms.

Diameter of the brazing rings is maintained to plus or minus tolerances of 0.001 in. Rings are made according to customer job specifications and range in wire thicknesses from 0.015 to 0.094 in., with inner diameters of 3/32 to 6 or more in.

THE LUCAS-MILHAUPT ENGINEERING CO., 5057 South Lake Drive, Cudahy, Wis.

* * *

Marquette Brings Out New A-C Welder

NEW a-c arc welder, Marquette Model 70, is a reactor-regulated welder without moving parts. It will be manufactured in 150, 200 and 250 amp capacities.

Each heat stage is calibrated to give exactly the heat indicated in the panel arrangement. Efficiency of the welder is 94%, according to Marquette.

Approved by Underwriters' Laboratories, Inc., the welder has a weather-proofed cabinet of sheet steel. It is mounted on rubber-tired wheels.

MARQUETTE MFG. CO., INC., 307 East Hennepin Ave., Minneapolis 14.

* * *

Spatterproof Cover Lenses Reduce Eye Strain

NEW, improved Thermacote "triple-duty" cover lenses are claimed to provide clear vision for days longer than ordinary cover glasses. This reduction in weldor's eye strain increases work quality and decreases time wasted in cleaning or changing lenses.

Lenses are not made of lacquer, says Thermacote. They are said to be waterproof, will not peel, blister, discolor or shatter from dropping.

THERMACOTE CO., 420 South San Pedro St., Los Angeles 13.

* * *

Benefitize Your Points!

No. 3 in a series of inspirational talks on "Twelve Self-Assignments to Sales Success"

BY RICHARD C. BORDEN

CUSTOMERS buy benefits. They don't buy nuts and bolts. They don't buy "product points."

Now . . . what does that mean? Does it mean that in order to "benefitize" a sales talk, you shouldn't mention product points at all?

No! It means merely this: Once you *have* introduced a product point, convert it into a customer benefit . . . before you introduce *another* product point.

Product points of the "nuts and bolts" type are effective sales ammunition as long as they are kept separated by intervening comments that begin:

"Now here's how that particular product feature benefits you!"

Regularly recurring use of the word YOU is a reliable earmark of a properly "benefitized" sales talk.

Maybe it's just an accident of letter sequence, but nonetheless it's worth noting that in the word "business" U comes before I!

So this month . . . all month . . . use plenty of YOU's in every sales talk you give. Make them outnumber by at least ten to one all the "I's," "WE's," and "OUR's" that slip into your conversation.

Do *more* than just "touch each base." Make sure each base you touch . . . is a benefit.

These articles, to be published one a month in THE WELDING ENGINEER, *are based on the script of a new Dartnell-Borden series of sales films, "Selling Against Resistance."*

PAGE *Welding* ELECTRODES

Page-Allegheny *Stainless Steel*

AC or DC

ARC
—stable even at very low amperage

SLAG
—clean, easily removed

COATING
—resists cracking down to very short stubs

SELECTION
—complete line for welding every type of stainless

DELIVERY
—prompt from warehouses in Chicago, Denver, Houston, Philadelphia, San Francisco and the factory at Monessen, Pa.

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

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AMERICAN CHAIN & CABLE

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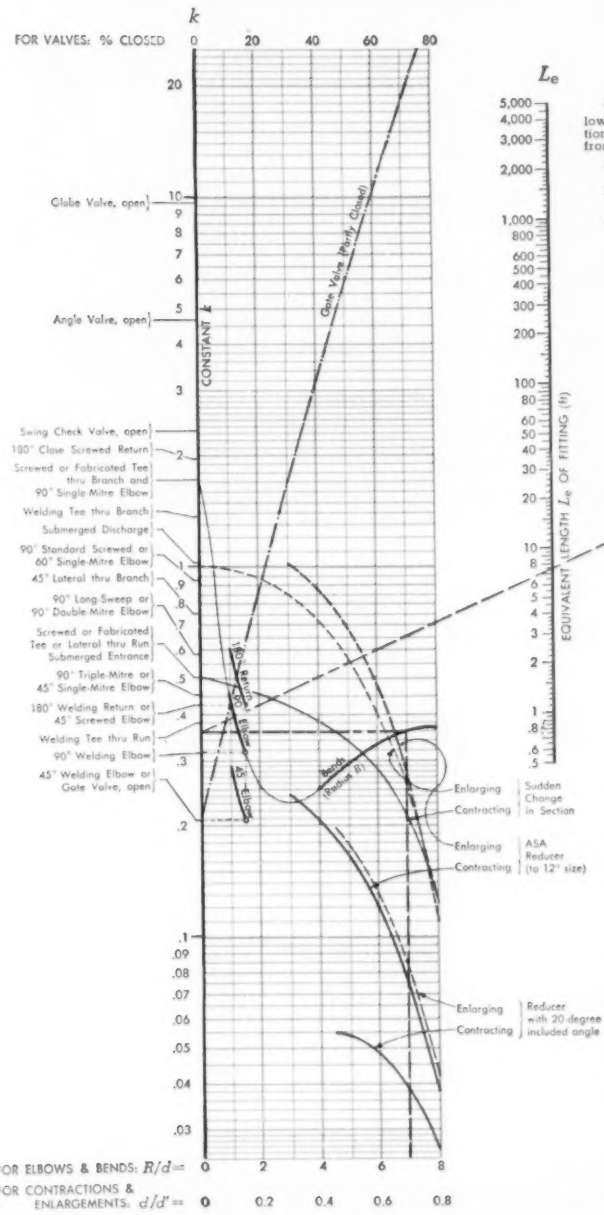
(Turbulent Flow*)


k
FOR VALVES: % CLOSED 0 20 40 60 80
Globe Valve, open
Angle Valve, open
Swing Check Valve, open
180° Close Screwed Return
Screwed or Fabricated Tee thru Branch and 90° Single-Mitre Elbow
Welding Tee thru Branch
Submerged Discharge
90° Standard Screwed or 60° Single-Mitre Elbow
45° Lateral thru Branch
90° Long-Sweep or 90° Double-Mitre Elbow
Screwed or Fabricated Tee or Lateral thru Run Submerged Entrance
90° Triple-Mitre or 45° Single-Mitre Elbow
180° Welding Return or 45° Screwed Elbow
Welding Tee thru Run
90° Welding Elbow
45° Welding Elbow or Gate Valve, open
CONSTANT k
Gate Valve (Part Closed)
180° Return Bend
45° Elbow
Bends (Radius 8)
Enlarging
Contracting
Sudden Change in Section
ASA Reducer (to 12" size)
Reducer with 20 degree included angle
FOR ELBOWS & BENDS: R/d =
FOR CONTRACTIONS & ENLARGEMENTS: d/d' =
Le
EQUIVALENT LENGTH Le OF FITTING (ft)
d
ACTUAL INSIDE DIAMETER d (inches)
NOMINAL PIPE SIZE, STD. WEIGHT (inches)

*For laminar flow, the following approximate corrections of the values obtained from this chart are suggested:

For all types of valves, no correction required.

For tees, increase values by 33⅓%.

For elbows and bends, multiply values by 5 to 10.

Valves and fittings cause head loss or pressure drop in excess of the amount caused by pipe of equal axial length. The excess loss in head (in feet of fluid) can be directly calculated by applying a factor K to the velocity head in the formula H (head) $= K\frac{V^2}{2g}$, or it can be taken into account in pressure drop calculations by adding the equivalent length L_e of each valve or fitting to the axial length of the system.

The values of K can be read at the left margin of the chart, either directly, or (for valves, elbows and bends, contractions and enlargements) after going through the chart as illustrated for an example below. The values of K can be converted into equivalent lengths L_e as referred to a friction coefficient of 0.006 by connecting the K-value with the pipe diameter and noting the intercept on the L_e-scale.

Example: Find K and L_e for 42-in. radius bend of 6-in. standard weight pipe. Enter bottom of chart with ratio $42/6 = 7$, go up to line marked "Bends" and across to K-scale, on which a value of 0.26 is read. Connect this point with 6 on d-scale and read 7.5 ft. on L_e-scale.

Courtesy of Tube Turns, Inc.

YOU HAVE UNLIMITED OPPORTUNITY FOR EXPANSION with VICTOR BASIC WELDING & CUTTING UNITS

The flexibility and wide range of Unit WC-26, shown here, enable you to do all usual welding and cutting operations, either in production or maintenance work. For special jobs such as hard-facing, multi-flame heating, deseaming, brazing, descaling, you simply add suitable tip, nozzle or attachment.

Keep your investment in apparatus low by starting with VICTOR's basic units . . . expand them as your need arises.

VICTOR apparatus is designed for faultless, economical operation. See your VICTOR distributor for free demonstration TODAY.

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Hard-facing alloys. Regulators for all gases. Machine and hand torches for welding, preheating, cutting, flame hardening and descaling. Portable flame cutting machines. Blasting nozzles. Cylinder manifolds. Cylinder trucks. Emergency pack-type flame cutting outfits. Fluxes. Write today for free descriptive literature.

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A Welding Engineer Reader Service

1 TWEEZER WELDER—Federal Tool Engineering, Inc., Newark 5, N. J. 4-page, two-color bulletin 250 and application bulletin 251 show tweezer, pencil and plier-type resistance welding tools for joining small wires and assemblies. For details, see page 44.

2 A-C TRANSFORMER WELDER—Hobart Bros. Co., Troy, O. Single-sheet bulletin illustrates the new Hobart reactor-controlled a-c transformer welder. More than 20 features and improvements in design are tabulated. For details, see page 45.

3 CYLINDER CONNECTIONS—The Burdett Oxygen Co., Cleveland 14. 4-page, two-color bulletin pictures and describes more than 20 cylinder connections and bushings. Also included are pictures of brushes, lighters, goggles, cylinder trucks and pressure gages.

4 WELDING CABLE—National Cable Corp., Milwaukee 15. Single-page poster and 4-page data sheet No. 1351 on "Major" welding cable explain special features such as rope-stranding the conductors, locking of jackets, etc. Sizes, weights, current capacities and a guide for selecting cables are among information included.

5 PROTRACTOR CLAMP—Bernard Welding Equipment Co., Chicago 19. Bulletin PBC-1 describes the improved Model B "Pro-Clamp" for holding piping or angle stock at various angles for welding. For picture, see page 45.

6 WHEEL AND AXLE SETS—Standard Equipment Co., Cedar Rapids, Ia. Bulletin describes the company line of utility axle and wheel assemblies used in welding shops for making boat, horse, paint trailers, etc. See page 45.

7 SHAPE CUTTING MACHINE—Krohn Mfg. and Supply Co., Centreville, Mich. 4-page folder tells about the Krohn pantograph-type machine for utilizing a manual cutting torch and homemade templates to cut irregular shapes. See page 44.

8 BANDSAW WELDER—The DoAll Co., Des Plaines, Ill. Single-sheet, two-color bulletin 50-820 pictures a small butt welder, Model DBW-10, mounted on the side of a bandsaw. Text covers capacity of welder, annealing features and accessories. See page 46.

9 R-W ATTACHMENT—Robert W. Hoffman Co., Inc., Chicago 6. Single-sheet bulletin describes the "Weld-Air-Matic," an attachment that adds air-pressure operation to foot-controlled rocker-arm spot welders.

10 ARC CUTTER—Clinton Machine Co., Clinton, Mich. 8-page, two-color bulletin shows how a new arc-cutting tool works. The "Metalmaster" pierces steel, tool steel, tungsten, cobalt, etc. Use of the power unit for arc welding, brazing, soldering and magnetizing is also shown.

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11 HARD-FACING IN STEEL MILLS —Air Reduction Sales Co., New York City 17. 8-page reprint of a technical article is titled "Hard-facing Applications in the Steel Industry." Written by Airco's J. J. Barry, it covers electrode-types, service conditions, techniques and welding methods.

12 TEMPERATURE INDICATORS—Tempil Corp., New York City 11. 6-page brochure 501 gives directions for using Tempilstiks, Tempilaq and Tempil Pellets. Available temperature ratings for all three types are listed and typical applications given.

13 PLASTIC LENS COVER—Thermacote Co., Los Angeles 13. 6-page, pocket-size, two-color folder describes the Thermacote "triple-duty" plastic cover lens for arc-welding helmets. Photos show how it stands up to welding spatter over ordinary lenses.

14 PIVOTED BLADE SHEARS—The Cleveland Crane & Engineering Co., Wickliffe, O. 8-page, three-color catalog 2011-C explains the operating principles and advantages of pivoted-blade shears. A large capacity model is pictured and each part named.

15 INDUSTRIAL PHOTOGRAPHY—Eastman Kodak Co., Rochester 4, N. Y. 16-page, four-color booklet, "Functional Photography in Industry" tells in non-technical language about modern industrial pictorial processes. Illustrations show photography's place in research, production, quality control, training, advertising and sales.

16 WELDING ACCESSORIES—Flood Safety Products Co., Chicago 12. 8-page pocket-size folder No. 1005 illustrates and describes six electrode holders, two ground clamps, a welding helmet, goggles and the Flood plastic cover lens.

17 WHITE METAL WELDING—Aladdin Rod & Flux Mfg. Co., Grand Rapids 7, Mich. 4-page folder describes the Aladdin method for welding white metal, brazing and soldering aluminum without flux. Edge preparation, flame adjustment, etc. are discussed.

18 CARE OF A-C MOTORS—Allis Chalmers Mfg. Co., Milwaukee. 24-page booklet, bulletin O5R7417, gives practical suggestions for preventive maintenance and repair of a-c rotating equipment. It covers such subjects as drying moist insulation, measuring insulation resistance, bearing clearances, stator coil repairs, etc.

19 CABLE CONNECTORS — Chicago Tool and Engineering Co., Chicago 17. 4-page, two-color bulletin 426 explains the quick-acting features of the Palmgren cable and terminal connectors. Last page of folder shows Palmgren insulation hose, weldor's micrometer and wire clamp tool.

20 R-W CONTROLS—Weltronic Co., Detroit 19. Single-sheet bulletin 6-A-5M-6/47 shows pictures of several resistance welding "package" control cabinets and describes the equipment in each of them.

21 PRECISION REGULATORS—National Welding Equipment Co., San Francisco 5, Calif. 16-page catalog OT-450-3M presents complete descriptions and photos of the National line of precision regulators for helium, argon, hydrogen and medical gases.

22 FUME EXHAUSTER—Chelsea Fan & Blower Co., Inc., Irvington 11, N. J. Single-sheet bulletin 962 describes the Chelsea "Octopus" blowers for exhausting and ventilating welding fumes from confined places.

23 CONTACT ELECTRODES—Eutectic Welding Alloys Corp., New York City 13. 4-page folder EV-16 gives the welding advantages of the "Handomatic" contact type electrode. Diagrams show types of joints for which it is useful.

24 A-C/D-C HARD-FACING—Stoody Co., Whittier, Calif. 4-page two-color folder describes the new Stoody a-c/d-c coated electrodes for hard-facing dredge spud clamps, drag chain links, etc.

25 WELDING MOLYBDENUM—Fansteel Metallurgical Corp., North Chicago, Ill. Methods and procedures for welding, brazing, drawing, annealing, etc. of molybdenum are detailed in 5-page bulletin 4.303. Most of the information has not been published before.

26 SILVER-BRAZED PIPING—United Wire & Supply Corp., Providence, R. I. 4-page, three-color bulletin gives clear diagrams and readable instruction for silver-brazed piping installations: it covers cutting pipe, cleaning pipe ends, fluxing and silver brazing. Small table for estimating the consumption of alloy is included.

27 HARD-FACING ELECTRODES—Alloy Rods Co., York, Pa. 8-page, two-color bulletin No. 10550 acquaints the reader with the company's basic hard-facing alloys. Wear factors, wear patterns, different electrode types, various welding procedures and suggested applications are covered.

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LOWER COST – BETTER WELDS

miller's NEW

INDUSTRIAL A.C. ARC WELDER

The MILLER Model 88 is a rugged, heavy duty 200 ampere, 50% duty cycle welder with a welding current range of 20 to 300 amperes. The Model 88 is built expressly for general welding and maintenance and production welding in garages, shops, industrial plants or wherever an industrial welder is needed. It is compact in design, easy to operate and built for long, trouble-free service. Two open circuit voltages are provided. This combines easy arc starting with lower KVA demand load and primary ampere input. 220 volt, 50-60 cycle units are standard although dual voltages can be supplied as optional equipment. The low cost combined with the portability and top quality makes the Model 88 the welding buy of the year.

SEE YOUR NEAREST miller DISTRIBUTOR TODAY

OTHER miller PRODUCTS—FOR BETTER WELDING AT LOWER COST!

- A.C. AND D.C. WELDING GENERATORS— GAS ENGINE OR ELECTRIC MOTOR DRIVEN
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- PORTABLE SPOT WELDERS
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- FARM AND UTILITY WELDERS
- CARBON ARC TORCHES
- CONTROL APPARATUS FOR "HELIARC" SPOT WELDING

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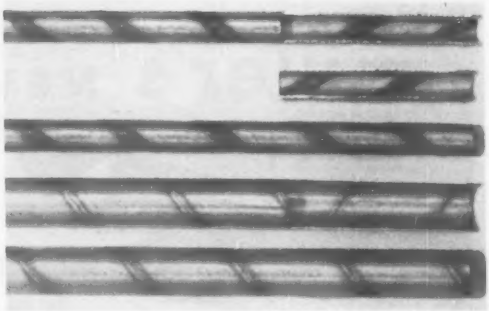
ELECTRIC MANUFACTURING COMPANY
APPLETON, WISCONSIN

The term "Heliarc" is a trademark of The Linde Air Products Co.

on the job

Courtesy The Lincoln Electric Co.

CONVEYOR at left feeds 2¾-in. shafts to a twin-head automatic welder. Yokes to be welded to shafts come in on conveyor at right



Courtesy The Linde Air Products Co.

STAINLESS TUBING spirally wound and inert-arc welded. Tubing at top is ⅜-in. diameter, 19 gage; bottom tubing is 9/16 in., 28 gage

Yokes Joined to Shafts

JOB OF A NEW automatic production welding machine installed by the Mechanics Universal Joint, division of Borg Warner, Memphis, Tenn., is the critical one of welding universal yokes to each end of a 2¾-in. automobile shaft.

A conveyor feeds the shaft to the machine. In the left picture above, the shafts can be seen entering from the left. The conveyor on the right brings in the yokes. Both yokes and shafts are previously chamfered to prepare them for vee joints.

The operator assembles the yokes on the shaft in the small jig in front of him. He then places the assembly in one of the four positions in the turret head of the automatic welder. The turret rotates and puts the shaft in proper welding position under the two "hidden-arc" welding heads.

Once the operator has started the cycle, it continues automatically. As soon as he places another assembled shaft in the front position of the turret, the wire electrode starts to feed down, the flux valves open, the arcs are kindled and the two welds are made simultaneously at both ends of the shaft. On each head, a small piece of fibre 1½ in. square makes a "dam" to prevent the automatically fed flux from spilling off the shaft.

The two welds are made in 11 seconds, using 3/32-in. electrode wire, 325 amp, 26 volts. As soon as welds are completed, the flux valves close, arcs are killed, wire feed stops and the turret revolves to position another shaft. The completed assembly is discharged at the rear of the machine.

The machine was designed and made by the Cecil C. Peck Co., Cleveland.

QUARTET of spot welders joins corners of sash. Air clamps tightly grip the members

Seconds for Sash Frame

By Walter Rudolph

TRUSCON STEEL CO., Youngstown, O., turns out thousands of steel window sash monthly by means of compressed air and spot welding. The latest set-up involves mobile machine placement, precise fixturing and four spot welders. With this equipment, a sash frame or vent (the part that goes inside the frame) is completed in a matter of seconds.

The four welding machines are placed to work on the four corners of a sash. The bottom welding arm of each machine holds a component of the fixture that provides positive locating stops and air-powered clamps. Bases of the machines are mounted for whatever movement may be necessary to accommodate different sizes of sash.

One operator can handle two machines. The two operators place the four members of the sash in the welding fixture, throw the air switch that clamps the four corners and press the button that starts the welds. It's as simple as that! The snaky tubes seen in the picture (courtesy of Compressed Air and Gas Institute) are for the removal of welding fumes.

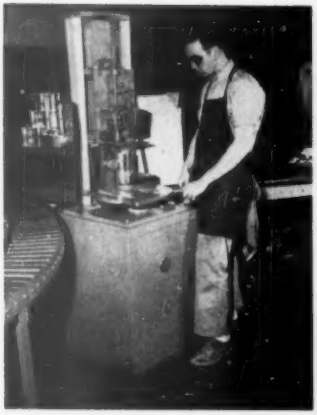
Welded Spiral Tubing

B & M MFG. CO., of Grand Rapids, Mich., makes tubing of almost any diameter and thickness by forming strip into a closed spiral and welding the continuous joint with an inert-arc welding head. The company has made its spirally wound tubing of stainless steel, Inconel and plain carbon steel. It could use the same process and equipment just as easily to make tubing of brass, aluminum or even magnesium. Diameters handled range from ¼ to 3 in., wall thicknesses from 0.015 to 0.0625 in. or more.

The coiled strip is placed on a forming machine and forced through the die that makes the spiral. As the tube emerges from the die, it passes under the inert-arc head and is automatically welded. It can then be given a cold draw to produce a perfectly smooth surface.

Right picture shows 304 stainless-steel tubing of ⅜-in. diameter, 19-gage thickness (upper tubes). A flat strip ¾ in. wide makes a spiral tube ⅜ in. in diameter. The larger tubes in the picture are 9/16 in. in diameter, 28-gage thickness.

For certain applications, hydrogen is burned inside the tube to prevent oxidation. The tubing shown in the picture did not require hydrogen back-up.



CARBON-ARC welder-fixture welds a nut to underside of stainless "burn-through" plug inserted in aluminum Diesel-engine piston

Plugs for Pistons

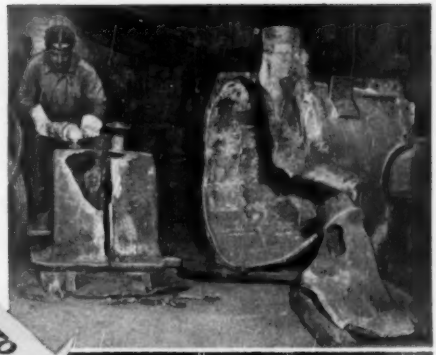
NEED FOR a special-purpose welding machine arose when engineers of the Caterpillar Tractor Co., Peoria, Ill., developed an improved design of aluminum-alloy piston for Diesel engines. A stainless-steel plug—somewhat resembling a conventional poppet valve—is inserted in the top face of the piston and secured by a nut on the short threaded stem. This gave rise to a new problem—to stop the nut from loosening in service.

Caterpillar men decided to weld the nut to the bolt for permanent locking. So far so good, but there was apparently nothing on the market that would do the job in mass quantities. Caterpillar went to the A. O. Smith Corporation's research laboratories in Milwaukee and asked for the development of a small automatic machine that could weld the nuts on a production basis.

The answer of A. O. Smith welding technicians is shown in the picture: a cabinet supporting a rotating table. The cabinet base contains the needed electrical equipment, and the table bears the piston-holding fixture. The welding head travels up and down on posts made of two vertical angles. Travel is activated by an air piston operating from inside the cabinet. The welding head contains a single carbon electrode, fed in automatically as it burns away.

With this set-up, all that the operator has to do is secure a piston in the fixture, rotate the table and turn an air valve to move the welding head into position. As soon as the head strikes a stop, it closes a micro-switch to start the sequence that ends in a finished weld.

A few hours and 60 pounds of Bridgeport's Low Fuming Bronze Rod restored to working order these smashed castings from an induction furnace used to melt brass.



SWITCH TO BRAZE-WELDING

BRAZE-WELDING CHEATS JUNK YARD

How many large castings have been relegated to the junk yard when Bridgeport's No. 192, Low Fuming Bronze Rod and a clever welder could have salvaged them?

This is a question only you can answer accurately, but we'll guess that there has been more than one such case.

Bronze-Welding can save you both time and money by reducing down-time on production lines. Quite often work can be done without dismantling of equipment as only local heating is necessary. The tinning action of Low Fuming Bronze Rod is excellent and the bond is, in most cases, stronger than the parent metal.

Not only is Braze-Welding a maintenance tool, but it can prove the answer to many welding production problems. Send for Bridgeport's booklet on Bronze Welding Alloys.

"Bridgeport" BRASS CO.

BRIDGEPORT BRASS COMPANY
Bridgeport 2, Conn. Established 1865
Mills at Bridgeport, Conn., and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

Bronze Welding Rod A PRODUCT OF **BRIDGEPORT BRASS**

FOR MAXIMUM RESULTS AT THE LOWEST COST!

● In these days when cost has so much to do with the profit you can make, you will do best on welding, cutting or safety equipment by checking with Burdox first! Typical of the outstanding values and superior quality of the entire BURDOX line are six items shown below. Feature for feature, they give you savings at the start and in length of service as well. Get acquainted with BURDOX value by writing for free 64 page catalog today.

CYLINDER TRUCKS

DELUXE

The greatest cylinder truck value you've ever seen! Streamlined one-piece safety handle. Streamlined tool tray and rack. Bicycle type wheels with solid rubber tires. All welded construction. Chain holds cylinders securely.

JUNIOR

Ideal for handling small size cylinders! All welded tubular construction, mechanical rubber tires, oilless bronze bearings. Rolls like a charm. Adjustable telescoping tubular device holds cylinders securely.

EYEGARD GOGGLES

The best goggle value on the market! Super-light, impact-resisting plastic and exclusive 10-way ventilation. Cool and sweat-free . . . always!

BURDOX A-C ARC WELDERS

(150-200-250 amp. types)

A whiz for work. Easy to operate. Weld up to 25% faster. Weld in any position. Shipped with accessories at a real saving!

EXTRA-FLEX CABLE

Extra-flexible, extra-resistance to abrasion, oil and water because of special construction. Millions of feet sold because of performance and price.

CYLINDER CONNECTIONS

All brass, made to close tolerances, to do the job as only welding men know it should be done. Guaranteed against mechanical defects. Finest made, save time and money, yet cost no more.

THE BURDOX LINE INCLUDES:

WELDING AND CUTTING EQUIPMENT AND MACHINES • SOLDERING AND BRAZING OUTFITS • INDUSTRIAL GASES • REGULATORS AND GAUGES • HOSE AND CABLE • ACETYLENE GENERATORS • GOGGLES AND HELMETS • LENSES AND FACE SHIELDS • ROD AND FLUXES • CLYINDER TRUCKS

THE BURDETT OXYGEN COMPANY

3302 LAKESIDE AVENUE CLEVELAND 14, OHIO

AKRON MANSFIELD CINCINNATI

GENERAL ELECTRIC

BERYLLIUM COPPER

(*Continued from page 39*)

results on strips of medium thickness; 16 welds per inch is about right.

Short weld-time periods will minimize softening of the metal adjacent to the weld. Joint strengths approaching the strength of the parent metal can be obtained if "on" times are kept short and heat localized. The less the weld time the less the precipitation of a beryllium-rich phase from the alloy; consequently, more beryllium is available for subsequent hardening by heat treatment to improve mechanical properties.

Metallurgically, resistance-welded beryllium copper is a coarse-grained structure—similar to that of other non-ferrous alloys. The designer should make an allowance when he designs a product for the weld-zone areas of decreased ductility, endurance and impact strength.

If you want to spot weld dissimilar metals, you've got to take account of their differences in electrical and heat conductivity. Use electrodes of different contour or different conductivity to localize the heat at the interfaces rather than within the base metal of lowest conductivity.

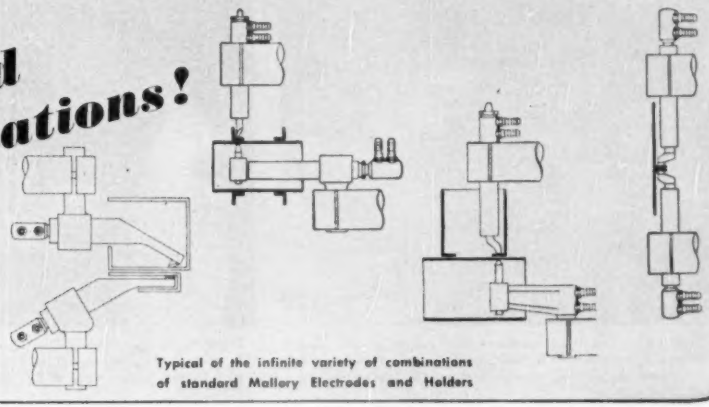
In using conventional spot-welding techniques to join beryllium copper to other metals, considerable care should be exercised in: (1) electrode selection, (2) keeping metal surfaces and electrodes clean, (3) maintaining close control over welding conditions. The following listing classifies as good, fair or poor the weldability for resistance welding of beryllium copper to the other metals and alloys mentioned.

Good	*Fair*	*Poor*
Cartridge brass	Copper	Carbon steel
Cupro-nickel	Red brass	Stainless
Nickel-silver	Aluminum	Magnesium
Silicon-bronze	Nickel	Zinc
Phosphor-bronze	Monel	Tin

The above classification is intended only as a general guide. Through special procedures any of these materials may be joined with beryllium copper to give suitable results for specific applications. For best results, equipment suppliers or their representatives should be consulted.

NEXT MONTH: *Mr. Richards will tell how beryllium copper may be welded by the various arc processes including inert-arc, metal-arc and carbon-arc.*

Value Beyond Expectations!



Typical of the infinite variety of combinations of standard Mallory Electrodes and Holders

STANDARD RESISTANCE WELDING ITEMS CARRIED IN STOCK FOR IMMEDIATE SHIPMENT:

Fluted Electrodes
Double Bend Electrodes
Single Bend Electrodes
Forged, Irregular Electrodes
Cast Irregular Electrodes
Swivel Electrodes
Gun Welder Electrodes
Elkonite* Faced Electrodes
Straight Holders
Off-set Holders
Bench Welder Holders
Paddle Type Holders
Universal Holders
Low Inertia Holders
Close Coupled Holders
Seam Welder Wheels
Seam Welder Shafts and Bushings
Elkonite Rod, Bars and Inserts
Alloy Rod and Bar Stock
Taper and Thread Adapters
Water Cooling Tubes
External Cooling Chambers
Tip Dressers and Files
Water Cooling Hose, Clamps and Connections
Alloy Castings
Alloy Forgings
Projection Butt and Flash Welding Dies

*Reg. U. S. Pat. Off.

Special Materials For Resistance Welding Are "Standard" At Mallory

At first glance, many resistance welding requirements are classified as special . . . and involve the high cost, long deliveries and difficult maintenance normally a part of special items. But many "specials" are standard items in the Mallory line.

This is the result of Mallory's more than 20 years of resistance welding and alloy experience . . . during which time the satisfaction of specific customer requests has accumulated a long list of standard products, now carried in stock for immediate delivery. The solution to your "special" problem with Mallory "standards" will mean immediately measurable savings in costs, delivery time and the need for maintenance . . . a natural combination for greater welding production and economy.

That's value beyond expectations!

Mallory's resistance welding know-how is at your disposal. What Mallory has done for others, can be done for you!

In Canada, made and sold by Johnson Matthey and Mallory, Limited 110 Industry Street, Toronto 15, Ontario

Resistance Welding Electrodes, Holders, Dies, Rod and Bars, Castings, Forgings

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Capacitors
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Special Switches
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Resistance Welding Materials

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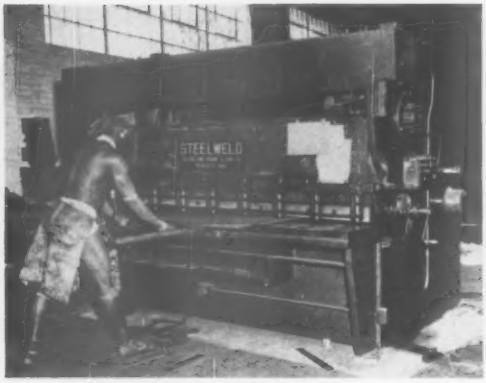
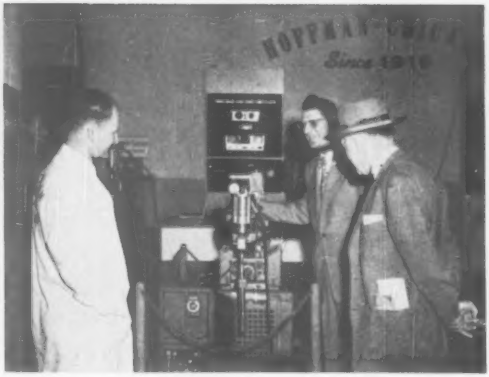


COOL COMFORT in his work clothes is achieved by a Zulu shear operator. This scene is at Steel & Power Products, Ltd., Johannesburg, South Africa. Photo courtesy Cleveland Crane & Engineering Co.



LOOKING at spot welding attachment at May open house of Robert W. Hoffman Co., Chicago. (L. to r.) P. A. Green, R. H. Hoffman and H. C. Kelsey, Weiger-Weed & Co., Rock Island, Ill.

NEWS OF WELDING AND WELDING MEN

New Tube Mill Opened by National Tube Co.

100,000 tons of steel pipe 26 to 36 in. in diameter will be turned out every year by the new tube mill recently opened by National Tube Co., subsidiary of United States Steel Corp. Stock is ¼ to ½ in. plate, formed and welded slightly undersize and expanded to exact dimensions by 1,700-psi water pressure.

Main welding of the formed sheet is by submerged-melt twin-arc a-c fusion welders. Ends of the sheet are welded by manual "squirt gun" submerged-melt welders. Inside welders for the piping seams also have twin arcs: d-c on the lead and a-c on the trailing.

* * *

Bay State Abrasive to Enlarge at Westboro

ADDITIONAL factory buildings and equipment to cost $250,000 will be added to the Westboro, Mass., plant of Bay State Abrasive Products Co. Construction will start immediately. In 1949, another $250,000 was put into new building and equipment.

* * *

Bureau of Shipping Publishes Interim Guide on Welding

THE American Bureau of Shipping has published an "Interim Guide for the Installation of High-Temperature Piping on Ships." These recommendations are intended to serve only until the new American Standards Association's Piping Code is completed.

The "interim" recommendations cover piping materials, thicknesses and allowable stresses, valves and fittings, bolting material, fabrication and welding.

* * *

Tricky Tube Welding in Mercury Boiler Plant

CLOSELY controlled welding of various size tubes to make boiler tubes that vary in ID had to be done as part of the recent mercury boiler installation at Portsmouth, N. H. The plant, the Schiller station of the Public Service Company of New Hampshire, uses mercury vapor instead of steam.

As the specific volume of mercury changes rapidly with increase in temperature and the formation of mercury vapor, the diameter of the tubes is successively increased. Front and rear walls of the furnace are 1½ OD by ⅞ ID at the bottom, increasing to 1⅝ OD by 1 ID and finally to 1 11/16 OD by 1⅛ ID at the top. Side walls were formed of five similar sections, each consisting of 28 tubes.

All tubing for the boilers was fabricated at the Beaver Falls, Pa., plant of The Babcock & Wilcox Tube Co. Welding was done at the B&W shops at Barberton, O. The plant was designed and built by the General Electric Co.

Chicago R-W Distributor Holds Open House

THE Robert W. Hoffman Co., Chicago held a well-attended Open House May 18 and 19 in its new office, showroom, and shop at 32 So. Clinton St. Some 400 people from Iowa, Wisconsin, Indiana, Michigan and the Chicago area came in during the two days.

Displays of spot, projection and gun welders were prominently placed about the new showroom as were exhibits of resistance welding accessories, attachments, grinding wheels and other equipment.

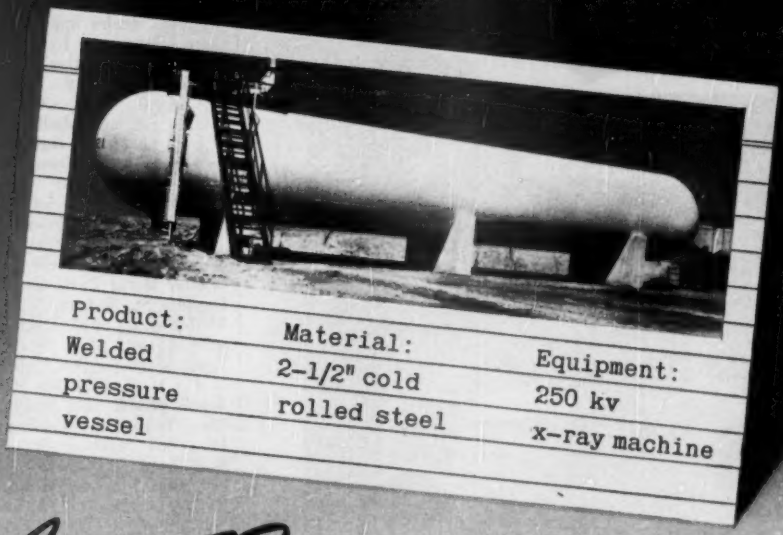
A door prize was given to the visitor who guessed most accurately the number of worn spot welding tips in a large glass jar. The winners were G. Treder, F. H. Hill Co.; J. Sexton, Harris Welding Supply Co. and Robert Zahn, Delta Mfg. Div., Rockwell Mfg. Co., Milwaukee.

Two of the Hoffman products, a butt welding attachment for spot welders and their new package air conversion unit for rocker-arm spot welders, were demonstrated.

Appetizers and refreshments were served to all visitors.

Officers of the company, after a recent consolidation, are Robert H. Hoffman, president and treasurer; Corinne V. Hoffman, vice-president, and P. Arthur Green as secretary.

WHAT'S THE RIGHT X-RAY FILM?



Product:	Material:	Equipment:
Welded pressure vessel	2-1/2" cold rolled steel	250 kv x-ray machine

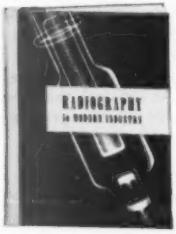
ANSWER:

KODAK INDUSTRIAL X-RAY FILM, TYPE F

To examine this pressure vessel, the radiographer was faced with a thick section of dense material, and with x-ray equipment low in power for the size of the job.

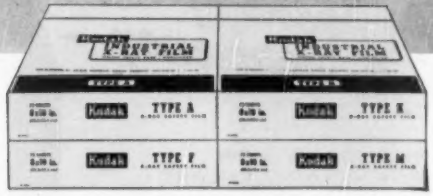
This called for Kodak Industrial X-ray Film, Type F. Because this film, exposed with Kodak Industrial X-ray Intensifying Screens, provides high contrast radiographs produced in the shortest possible exposure times.

Type F, exposed direct or with lead-foil screens, gives good results where wide exposure latitude is required, such as when a wide range of section thicknesses is to be recorded in a single radiograph.



RADIOGRAPHY IN MODERN INDUSTRY

A wealth of invaluable data on radiographic principles, practice, and technics. Profusely illustrated with photographs, colorful drawings, diagrams, and charts. Get your copy from your local x-ray dealer—price, $3.



A TYPE OF FILM FOR EVERY PROBLEM

To provide the recording medium best suited to any combination of radiographic factors, Kodak produces four types of industrial x-ray film. These provide the means to check welds efficiently and thus extend the use of the welding process.

Type A—has high contrast with time-saving speed for study of light alloys at low voltage and for examining heavy parts at 1000kv. Used direct or with lead-foil screens.

Type M—provides maximum radiographic sensitivity, under direct exposure or with lead-foil screens. It has extra-fine grain and, though speed is less than in Type A, it is adequate for light alloys at average kilovoltage and for much million-volt work.

Type F—provides the highest available speed and contrast when exposed with calcium tungstate intensifying screens. Has wide latitude with either x-rays or gamma rays, exposed directly or with lead screens.

Type K—has medium contrast with high speed. Designed for gamma ray and x-ray work where highest possible speed is needed at available kilovoltage without use of calcium tungstate screens.

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X-ray Division • Rochester 4, N. Y.

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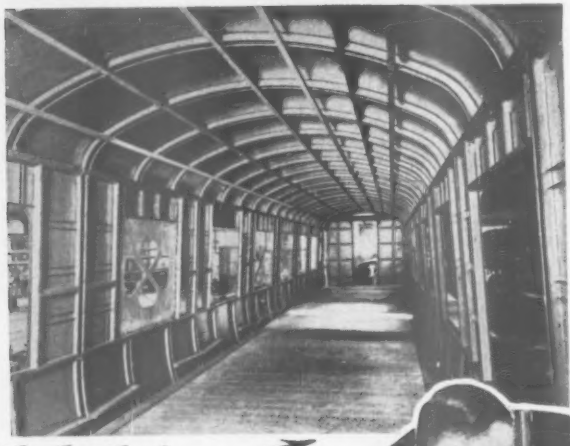
STUD WELDERS
and
STUDS
(fully patented)



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for efficiency

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- OTHER USES INCLUDE SIGNAL AND WAGON CONSTRUCTION. FLOOR FIXING, AND RAIL BONDS.
- LIGHT, PORTABLE AND EASY TO USE—WELDS ALUMINIUM, BRASS, MONEL, MILD AND STAINLESS STEELS
- *CYC-ARC WELDERS WILL BE WORKING AT NATIONAL METALS EXPOSITION CHICAGO OCTOBER 23-27 BOOTH 2654*

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ENQUIRIES ARE INVITED FROM AMERICAN ENGINEERING CONCERNS WITH VIEW TO LICENSED MANUFACTURE AND SALE OF WELDERS, STUDS AND ATTACHMENTS IN THE UNITED STATES

Westinghouse Electric Names New Dealers

WELDING dealer appointments made since February by Westinghouse Electric Corporation's welding department include the following:

Eastern district—All-Sil Welding Metals, Inc., 299 Madison Ave., New York City 17 and National Welding Sales, Inc., 212 Center St., Ithaca, N. Y.

Southeastern district — Calloway Brothers Welding Supply Co., P. O. Box 1225, Panama City, Fla.; Welder's Supply Co., Little Rock, Ark.; Wilson Motor Parts Co., 210 South Douglas St., Wilson, N. C.; Kilgore-McRee Co., 4612 Avenue V, Birmingham 8, Ala.; North Carolina Equipment Co., Box 1205, Charlotte, N. C.; H. B. Williams Supplies, 811 North Beach St., Daytona Beach, Fla.; Industrial Welding Supplies, Inc., 361 Meeting St., Charleston, S. C., and 2204 Taylor St., Columbia, S. C.; Braun Welding Supply Co., 819 Oak Ave., Lafayette, La.; Hart Supply Co., 350 Broad St., Columbia, Miss.

Northwestern district — Harris Welding Equipment Co., 518 North Bishop St., Chicago 22 and Quinn Welding Supply Center, 2826 Chicago Road, Chicago Heights, Ill.

Southwestern district — Alamo Welding Supply Co., 3411 Fifth St., Austin, Tex., and Kirk-Wiklund & Co., 1704-06 Baltimore, Kansas City, Mo.

Pacific Coast District—R. M. Wade & Co., 106 S.E. Hawthorne, Portland, Ore.; Union Hardware and Metal Co., 411 East Fourth St., Los Angeles 54 and Fresno Oxygen & Welding Suppliers, P. O. Box 1427, Fresno, Calif.

* * *

National Cable Corp. Formed in Milwaukee

NATIONAL CABLE CORP., 2737 South 34th St., Milwaukee 15, has succeeded Welding Engineering Corp., of the same address. National Cable will engage solely in the national distribution of "Major" welding cable and "Admiral" power cable.

President is Herman Hollowell, who also acts as general manager. William E. Burns is vice-president and sales manager.

* * *

Denton & Anderson Moves

THE DENTON & ANDERSON CO., Chicago representatives of Taylor-Winfield Corp., recently moved to 9 South Clinton St., Chicago 6, from its former offices at 543 West Washington Blvd.

YOU SAVE

WHEN YOU BUY WELDING CABLE FROM

WELDING CABLE HEADQUARTERS

USERS . . . Lowest Prices Guaranteed

DEALERS . . . New Exclusive Deal

Write "ART" FRIESE — TODAY . . .

for set-up based on 15 years concentration on WELDING CABLE.

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WELDING RODS

ELECTRODES • MOLY RODS

- Perfect Color Match
- Like Expansion and Contraction

Fuse-Well

Cast Welding Rods

CAST ALUMINUM RODS & FLUXES

THE CHICAGO HARDWARE FOUNDRY CO.

"Dependable Since 1897"

2070 Commonwealth Ave. NORTH CHICAGO, ILLINOIS

GLENN G. GARMAN, newly elected president of the National Welding Supply Association. Mr. Garman is 51 years old and has been in the welding supply business since 1930. He was one of the incorporators of Purity Cylinder Gases, Inc., Grand Rapids, Mich., and serves as vice-president and secretary of the firm. He attended the first NWSA meeting in Dayton, O., and has been at every one since

* * *

Stud Welding Speeds Siding, Roofing on New Alcoa Plant

RECORD-breaking speed for roofing and siding was established on the new Aluminum Company of America's Point Comfort, Texas, works. More than 18,000 squares of corrugated aluminum roofing and siding were applied, necessitating as many as 35,000 composite aluminum and mild steel studs on a single building. A 7-man team, four stud welders and three sheeting men, hit a steady stride of between 2,500 and 4,000 sq ft of siding per day.

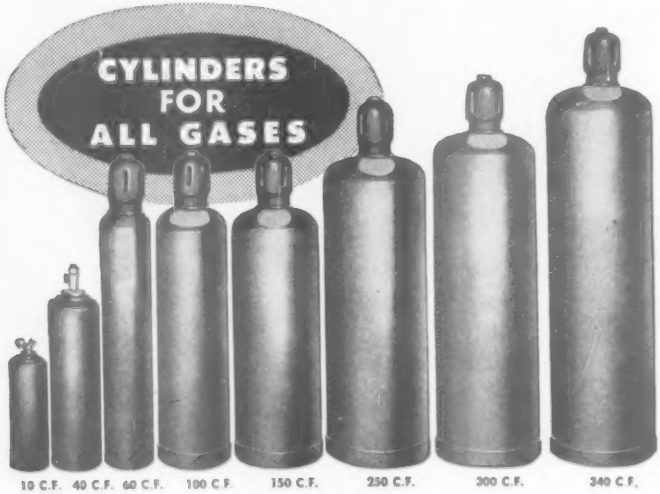
Special templates, 20 to 24 ft long were clamped to steel struts to speed layout work, according to H. W. Wilson, of the Jamar-Olman Co., contractor for the siding. To save equipment, four stud-welding guns were operated from a single 300-amp generator.

* * *

Bausch & Lomb Handle Welding Lens Coating

PURCHASERS of Bausch & Lomb Ophthalmic lenses may now have them coated with "Tuf-Cote," a preparation that makes them resistant to weld spatter and emery pitting. The preparation is made by the Wallace Optical Co., Inc., Detroit.

Both surfaces of the lens may be treated if desired, according to Frederick J. Koeth, manager of Bausch & Lomb's protective eyewear division. The coating is applied largely to safety glasses but may be used for everyday prescription glasses, too.



INDEPENDENT Acetylene Cylinders take from 5 to 10% more gas. Uniformity of monolithic filler insures even distribution of acetone. Storage cylinders available in 12' and 20' lengths, of 850 and 1,500 cu. ft. capacities.

INDEPENDENT ENGINEERING COMPANY, Inc.

Manufacturers of

CONSULTING · DESIGNING · RESEARCH

CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN

O'FALLON 5, ILLINOIS

We Invite Your Inquiries

Semi-automatic Plug Welding Builds Ships "Down Under"

WHYALLA (South Australia) shipyard of the Broken Hill Proprietary Co., Ltd., has developed a semi-automatic rig for plug welding. Operating on the submerged-melt principle, it is said to complete a plug weld every 10 seconds after the correct length of the electrode to fill the hole has been determined.

—*McGraw-Hill World News.*

* * *

List of Welding Books Published by Ohio State

A LIST of welding titles in the A. F. Davis Welding Library at the department of welding engineering at Ohio State University, Columbus, O., is available on request. It is designated Engineering Experiment Station Circular 51.

* * *

Turkey Buys Welders to Repair Farm Tools

MOBILE machine shops with built-on welders have been purchased in this country by the Turkish government to repair farm machinery. The shops provide a space 8 by 8 by 14 ft long according to The Lincoln Electric Co. Besides a 300-amp welder, oxyacetylene welding equipment, an air compressor and 12 kw a-c generator, many hand tools are included.

* * *

New Distributors

AMPCO METAL, INC., Milwaukee: Jaeger Welding Supply, Inc., Springfield, Mass., and Texas Welding Supply Co., Dallas will handle the company's complete line of arc and resistance welding electrodes.

* * *

THE MIR-O-COL ALLOY CO., Los Angeles: Sam Byers, 3134 East 10th St., Oakland 1, Calif., will be representative for Washington, Montana, Utah, parts of California and Nevada, British Columbia and Alberta.

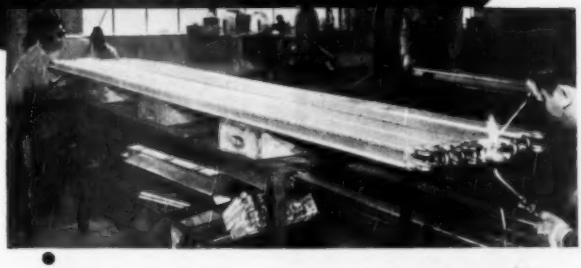
* * *

LAPEER MFG. CO., Lapeer, Mich.: Higginson Engineering Sales, P. O. Box 23, Hamilton, Ont. will carry a complete stock of toggle-action clamps and pliers.

* * *

SPERRY PRODUCTS, INC., Danbury, Conn.: Charles T. Morgan, 21 Lothrop St., Beverly, Mass., will handle non-destructive ultrasonic testing instruments, hydraulic remote controls, self-sealing couplings and transformers.

A *SURE* WAY TO GET LEAK-TIGHT JOINTS IN BRASS AND COPPER TUBING



BRAZE WITH *SIL-FOS*

Above you see the return bends on the two ends of a copper refrigerating coil being brazed with SIL-FOS in the Kramer Trenton Co. plant, Trenton, N. J. This company turns out hundreds of coils of all types and sizes a week, with from 10 to 40 brazed joints per unit — every one brazed with SIL-FOS — and every one meeting a critical water pressure test.

Like so many other manufacturers of refrigerating equipment, Kramer Trenton use SIL-FOS because their experience has proved conclusively that this low temperature silver brazing alloy for nonferrous metals is 100% reliable in making leak-tight joints — and does it fast and at a cost per joint that is pleasingly low.

BULLETINS 12-A AND 17 TELL YOU WHY AND HOW

Bulletin 12-A explains why leaktightness, strength and ductility are inherent in every SIL-FOS brazed joint. Bulletin 17 tells how to braze pipe and tubing with SIL-FOS. Write for copies today.

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With 20 years active experience in this phase—of the Welding Industry . . .

I now offer full details
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333 N. MICHIGAN BLVD.
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***Phone:* ANdover 3-2337**

Welded Steel and Wood Floors for Boxcars

ARMCO STEEL CORP., Middletown, O., has developed a new composite steel and wood floor for box cars, gondolas and flat cars. It consists of hat-shaped steel ribs across the width of the car, alternated with wood planks bolted to the rib flanges. The ribs are welded to the car's center sill, stringers and side sill angles. Top surfaces of the hat sections extend slightly above the wood to support most of the load and take most wear and tear. Based on a 25-year car life, overall cost of the new floor is expected to be 45-50% less than conventional wood flooring.

* * *

Welding Fitting Catalog Has Pictorial Index

A NEW welding fitting catalog, No. 48, published by Midwest Piping & Supply Co., Inc., St. Louis 2, features a pictorial index and a 65-page technical reference section. It includes digests of more than 20 SA and ASTM specifications covering pipe, fittings, flanges. You can get a copy of the 184-page catalog by writing on your company letterhead to Midwest.

* * *

Percussion Welded Frames Avoid Upset Metal

HOW TO percussion weld aluminum sections without any flash is explained in a recently issued bulletin of the Reynolds Metals Co., Louisville, Ky. Upset metal that formerly extended ¼ in. across the weld zone has been reduced to only 0.01 in. Metal adjacent to the weld zone is not weakened from the annealing.

* * *

Dravo Corp. Modernizes Ten River Barges

TEN deck barges of the Corps of Engineers, U. S. Army, Mississippi River Fleet will have their sides, bottoms, side framings and brackets replated with about 500 tons of steel plating, ⅜ in. thick. Dravo Corp., Pittsburgh, is doing the job. The barges are used for carrying concrete revetment mats.

* * *

Zeisel Forms New Firm to Sell Welding Alloys

A. E. ZEISEL, formerly with Eutectic Welding Alloys, Inc., has formed Frigilatem Welding Alloys, Inc., with address at 1516 Corlies Ave., Neptune, N. J. The new company will develop and merchandise improved low temperature welding rods and fluxes for oxyacetylene and arc welding.

JACKSON GOGGLES

• FOR WELDING
• FOR CHIPPING AND GRINDING

Jackson Goggles give adequate protection against the hazards of the jobs for which they are recommended. But to be effective they must also be worn. So we made them attractive in appearance, light and easy to wear. They are easy to adjust to any head size, and eye cups are easily fitted against the wearer's face.

The headrest type goggles, shown above, have concealed springs to hold the goggles gently against the face, and may be moved up and down with one hand.

Made in four types as shown below, the welding goggles have 50 mm. lenses in shades from 3 through 6, with cover glasses for protection. The grinding goggles have clear hardened lenses only.

JACKSON
PRODUCTS
WARREN • MICHIGAN

W•50 WR•50
FOR GAS WELDING

G•50 GR•50
FOR CHIPPING AND GRINDING

SOLD EVERYWHERE BY SAFETY SUPPLY DEALERS AND WELDING SUPPLY HOUSES

Award Jury Announced by Lincoln Foundation

A FIVE-MAN jury of award was scheduled to meet late in June on the University of Washington campus in Seattle to judge papers in the 1949-50 competition of the Annual Undergraduate Award and Scholarship Program of the James F. Lincoln Foundation.

Chairman of the jury is Dr. E. E. Dreese, chairman of the department of electrical engineering at The Ohio State University, Columbus, O. Other members include Gilbert S. Schaller, professor of mechanical engineering, University of Washington, Seattle, Wash.; Emmet B. Moore, chairman, department of civil engineering, State College of Washington, Pullman, Wash.; J. B. Wells, professor of structural engineering, Stanford University, Stanford, Calif., and S. H. Graf, professor of mechanical engineering, Oregon State College, Corvallis, Ore.

Undergraduates writing the 78 best papers will be given prizes totaling $5,000. First prize is $1,000. Scholarship funds totaling $1,750 will be given to schools in honor of the main award winner.

* * *

Titanium Research Results Available

DETAILS of extensive research on titanium alloys are now available to the public. One of these alloys is said to have the strength of high-strength steel with half its weight.

The report was prepared by the P. R. Mallory Co., Indianapolis. Designated as PB 100 000, *The Manufacture of Titanium Alloys*, it is available through the Office of Technical Services, U. S. Dept. of Commerce, Washington, D. C.

* * *

"Ouch! It's those sparks, not the spikes."

Simultaneous Flame Cutting— Softening eliminates cracks on certain steels

A STEEL COMPANY faced the well-known problem that silicon and alloy steels, when heated to the point required by oxyacetylene cutting, and allowed to cool by air, will develop a high degree of hardness. Also, they develop cracks along the cut edge. The company wanted to retard the cooling rate with an annealing flame, and eliminate this hardness and attendant cracking.

A. H. Yoch, Airco Technical Sales Service Specialist, suggested and assisted in developing equipment and technique for flame softening the steel simultaneously with the machine gas cutting operation.

He devised a special torch set-up (as illustrated) with the annealing flame following closely, in a fixed position, behind the cutting flame. This retarded the cooling, eliminated the need for manual softening, and resulted in a faster, superior annealing job. By retarding the cooling rate with an annealing flame, the hardness and attendant cracking were dispelled.

Further, the speed with which the Airco No. 4 Radiagraph operates saved many production hours—a money-saving performance fact that is constantly winning new friends for this unique gas cutting machine.

For more information about flame cutting and softening, or for Technical Sales Service on a problem involving the use of the oxyacetylene flame or electric arc, call your nearest Airco office.

AIRCO **AIR REDUCTION**

Offices in Principal Cities

TECHNICAL SALES SERVICE—ANOTHER AIRCO PLUS-VALUE FOR CUSTOMERS

THERE'S SAFETY IN THESE NUMBERS

No. 335 Welders Coverspec Goggles

No. 31 Grinders and Chippers Goggles

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Canadian Welding Societies Finish Busy Year

THE Toronto, Hamilton, Niagara, Kitchener-Waterloo and Montreal chapters of the Canadian Welding Society have had an active season. As a sample: The Toronto chapter heard Gordon Cape, welding engineer, Dominion Bridge Co., Lachine, Que., speak on "Welding Applications in a Structural Plant" at its April meeting. Officers for 1950-51 elected following Mr. Cape's paper:

Chairman: A. S. Tuttle, International Nickel Co.; vice-chairmen: J. M. Gulley, George Rumble Co., and A. V. Phillips, Toronto Iron Works; treasurer: W. A. Simpson, Art Wire & Iron Co.

The May meeting of the Toronto section was a "Stump the Experts" night. Teams from Toronto, Hamilton, Niagara and Kitchener took part. Prizes were given to the winning team and to members submitting good questions.

Gordon Cape was also the speaker at the April meeting of the Hamilton chapter. He spoke on "Welding of Stainless and Clad Plates." It was announced that the Hamilton chapter is giving a $100 scholarship to Hamilton College, division of McMaster University.

New officers of the Niagara chapters are:

Chairman: Allan Clarke, Ontario Paper Co.; vice-chairman: J. W. Large, Provincial Engineering Ltd.; secretary: R. F. Scott, Horton Steel Works; treasurer: A. Allen, English Electric Co., past-chairman, W. A. Holt, Addison Industries.

Final meeting of the Kitchener-Waterloo chapter for the year was held at the Golden Lion Restaurant in Kitchener. Election of officers took place at that time.

Speaker for the April meeting of the Montreal section was A. S. Tuttle, International Nickel Co., Toronto. Meeting was held at the Queens Hotel. The following officers for the next year were elected:

Chairman: S. Johnston, Dominion Oxygen Co.; vice-chairman; C. Clermont, Welding & Supplies Co.; secretary: Y. Lanouette, Arts & Trade School; treasurer, W. Holcroft, Canadian National Railways.

* * *

James F. Lincoln Honored by Ohio State University

THE HONORARY degree of Doctor of Science was conferred upon James F. Lincoln, president of The Lincoln Electric Co., on June 9 at commencement exercises of Ohio State University.

About People

E. J. MORSE, executive vice-president of The Burdett Oxygen Co., Cleveland, was recently guest at a 25-year testimonial dinner given by his follow workers. When Mr. Morse joined Burdett in 1925, the firm employed only five people. Today it has more than 200 people working in the home office and branches in Akron, Mansfield and Cincinnati, and Los Angeles, Calif.

* * *

ISAAC HARTER, chairman of the board of The Babcock & Wilcox Tube Co. has been named a Fellow of the American Society of Mechanical Engineers. Mr. Harter and a selected group of B&W engineers constructed the penstocks for Hoover Dam, the largest job of its kind in the world at that time. He has also been a pioneer in the welding of heavy boiler drums and X-ray inspection of pressure vessels. In 1944-45, he was vice-president of the American Welding Society.

* * *

GEORGE R. WEBER was elected treasurer of Raybestos-Manhattan, Inc., at the recent annual meeting of the board of directors. W. S. SIMPSON was elected secretary and W. WARD KIEVIT a director.

* * *

HUGHES WASSERMAN, early pioneer in European welding, was recently honored at a testimonial luncheon given in New York City by RENE D. WASSERMAN, his son and president of Eutectic Welding Alloys Corp. The elder Mr. Wasserman has since returned to his plant at Lausanne, Switzerland.

* * *

ERNEST G. ENCK, secretary of Foote Mineral Co., Philadelphia, makers of electrode coatings, recently completed a five-week flying trip to South Africa, Southern Rhodesia, Southwest Africa and Europe. Mr. Enck visited company holdings and ore deposits of interest to the company.

* * *

E. W. CONNOLLY has been appointed sales manager of the Detroit district of Haynes Stellite Division, Union Carbide and Carbon Corp. He succeeds R. D. GUNTHER, who has retired.

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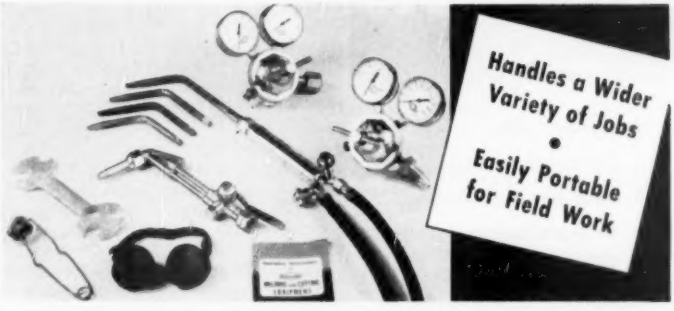

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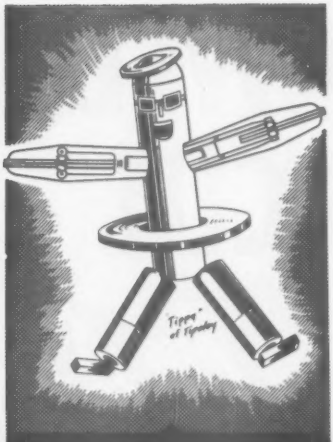

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Offices in Principal Cities

E. P. GRUCA, welding engineer in the research and development division of Pullman-Standard Mfg. Co., Hammond, Ind., has won an A. P. Sloan Fellowship for Executive Development. Starting June 12, he has embarked on a year's work in business and engineering administration and economics at Massachusetts Institute of Technology, Boston. He is one of 14 men in the country so honored.

* * *

A. F. BOUCHER has been named district manager in the Detroit area for the Lincoln Electric Co. Mr. Boucher helped develop new welding techniques for tanks and armored vehicles while serving in Detroit during the war with the Army Ordnance Department. I. R. BARTTER has taken over the Milwaukee district, left by Mr. Boucher. Mr. Bartter has been active in the development of automatic and semi-automatic welding.

* * *

30 YEARS AGO

(From THE WELDING ENGINEER of July, 1920)

REVIVAL of the question of welding the Liberty Bell was brought up again in the *Literary Digest* of June 26. Charles W. Duke, a Philadelphia electrical engineer, has advised arc welding the crack in the old bell, silent since 1835. He also has advised stress relieving the bell, whether it is welded or not, to prevent any further breakage from locked-in stresses. A newspaper in Columbus, O., says, "the old Liberty Bell is not half so badly cracked as that addlepated Philadelphian who wants to weld it with his patent device."

—30 YEARS AGO—

THE Big Three Welding & Equipment Co., Fort Worth, Tex., recently opened its doors for business. Those active in the organization of the new company are Cyrus K. Ricket and Ben K. Smith.

—30 YEARS AGO—

RESULTS of using the new automatic arc welding machine on axle housings, crane wheel flanges, motor shafts, radiator covers, etc., are pictured in an article in THE WELDING ENGINEER this month written by H. L. Unland, General Electric Co.

—30 YEARS AGO—

MEMBERSHIP in the Chicago weldor's union has reached more than 100, according to C. H. Knight, secretary. Mr. Knight is inviting weldors from all over the country to join.

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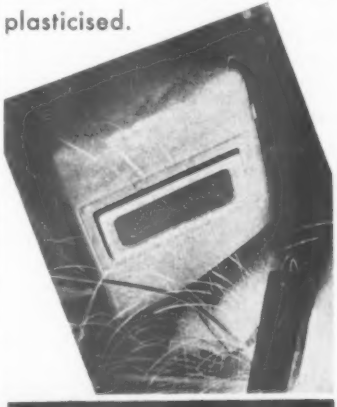

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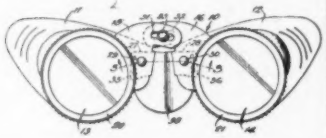
From the Patent Office

Goggles

2,503,117. Robert L. Malcom, Chicago. Assigned to Chicago Eye Shield Co., Chicago. Filed March 6, 1946. Granted April 4, 1950.

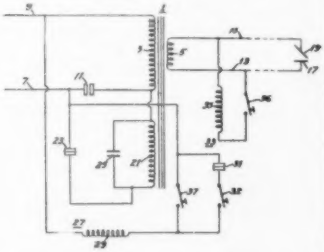


New goggles have a pair of lens boxes having a lens receiving portion and a flanged portion. A U-shaped bracket for each lens box encompasses the flanged part. One arm of each U-shaped bracket is provided with means for connecting the lens boxes. The other arm is provided with a slotted ear. A nose piece covers the rivets and has extensions going into the slotted ears.

* * *

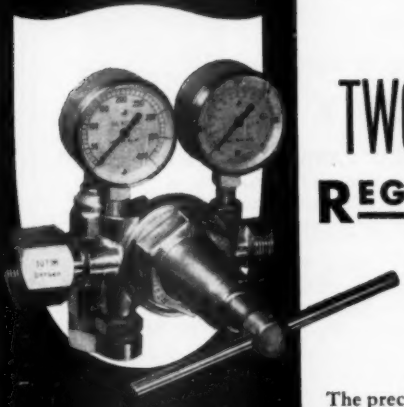
Arc Welding Circuit

2,502,646. Dean C. Girard, San Leandro, Calif. Assigned by mesne assignments to National Cylinder Gas Co. Filed Jan. 16, 1948. Granted April 4, 1950.



Patent covers an arc welding circuit that has a transformer for supplying welding voltage, leads to a power source and leads to electrodes. A high reactance winding is in series with the transformer's primary winding for lowering welding voltage below normal. This winding has sufficient reactance to maintain a smooth arc at the welding electrode at a low voltage. A relay responsive to secondary voltage connects the primary winding for energization directly across the power source.

REGO



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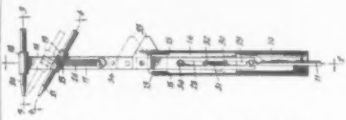
Twin Carbon Electrode Holder

2,503,729. Frank Gruszecki, Buffalo, N. Y. Assigned one-half to Henry Rothenberg, Buffalo, N. Y. Filed Nov. 8, 1947. Granted April 11, 1950.

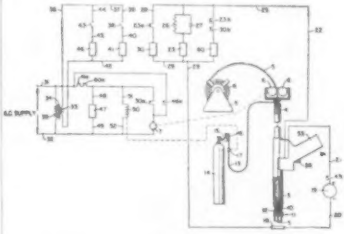


A twin carbon electrode holder comprises a tubular handle, an insulating strip inside the bore of the handle and relatively movable conductor bars supported at their inner ends at opposite sides of the strip. The bars terminate at their outer ends in holders for the carbons. The strip is held in the handle by a detachable retainer. One of the conducting bars can be moved rearwardly to a non-arcing position. A thumb-engaging handle is applied to the retractible bar for moving the electrode forward to an arcing position.

* * *

Arc Welding Aluminum

2,504,868. Albert Muller, Plainfield, Glenn J. Gibson, Somerville, and Nelson E. Anderson, Scotch Plains, N. J. Assigned to Air Reduction Co., Inc., New York City. Filed Jan. 21, 1949. Granted April 18, 1950.



Newly patented method of arc welding aluminum involves a continuous aluminum electrode connected to a source of welding current. The electrode is fed to the workpiece through a pistol-like gun at a rate of at least 100 inches per minute. Argon gas also comes from the gun to shield the arc and molten puddle. Direct current is supplied to the electrode and workpiece on reverse polarity. Current density (D) in the electrode has a value of:

$$D = \frac{B}{3} + C$$

where C varies from —10 to +10, D is the current density in 10^3 amps/ sq in. and B is the rate of wire feed in inches per minute.

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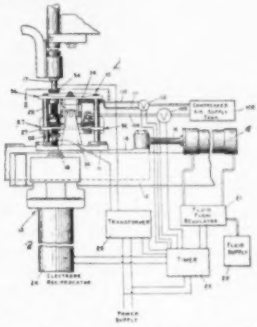
R-W Tip Cleaner

2,503,382. SIMON FISHER, Bay City, Mich. Assigned to National Electric Welding Machines Co., Bay City, Mich. Filed July 2, 1949. Granted April 11, 1950.

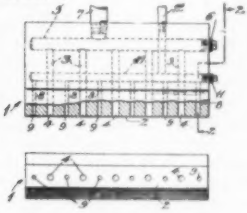


A newly patented resistance welding electrode tip cleaning device includes a pair of parallel, spaced head plates and means for moving one head plate toward and away from the other. A shaft is rotatably supported on the head plates and extends through one head plate. The pair of head plates are movable to align the shaft axially with the electrode. A clean head is fastened to the end of the shaft extending through one head plate. The cleaning head is movable with respect to the other head plate. Springs hold the cleaning head away from the other head plate and cause it to engage the electrode with a yielding pressure.

* * *

Flame-Cutting Tip

2,501,724. HOWARD G. HUGHEY, Fanwood, N. J. Assigned to Air Reduction Co., Inc., New York City. Filed Feb. 15, 1946. Granted March 28, 1950.



Newly patented tip for flame cutting metal consists of a discharge face that is elongated in the direction of the length of the cut to be made. There are means for projecting from the discharge face a row of spaced cutting oxygen jets directed at right angles to the work surface. Other means project preheat gases from the tip to form streams of a combustible gas mixture that alternates with the cutting oxygen jets.

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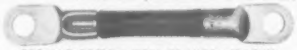

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Arc Welding Method

2,504,867. ALBERT MULLER, Brooklyn, N. Y. Assigned to Air Reduction Co., Inc., New York City. Filed June 22, 1948. Granted April 18, 1950.

This patent covers a method of welding with an electric arc utilizing a continuous metallic wire. Adjacent the arc, a gaseous shield of predetermined composition (10 to 50% carbon dioxide and from 50 to 90% carbon monoxide) is delivered.

* * *

Contact Welding Electrode

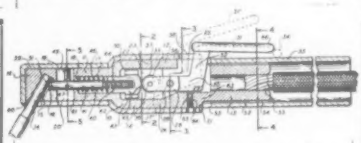
2,504,630. HENRY BIENFAIT, WILLEM PETER VAN DEN BLINK and SIMON DIRK BOON, Eindhoven, Netherlands. Assigned to Hartford National Bank and Trust Co., Hartford, Conn. Filed April 7, 1947. Granted April 18, 1950.

A patented composition of materials for the coating of contact arc welding electrodes includes 20 to 50% iron powder from 5 to 80% of a semi-conducting titanium oxide.

* * *

Heavy Duty Electrode Holder

2,504,607. MARTIN WELLS, Pasadena, Calif. Filed Nov. 15, 1948. Granted April 18, 1950.



Patent covers an electrode holder for welding with currents of upwards of 400 amp. It consists of a metal body with provision at the end for connection to a welding cable. An electrode receiving opening in the front part of the body is next to a small window opening. A channel in the body receives a clamping pin that connects the window with the electrode opening. Another passage connects the window with a side face of the body. A threaded clamping pin in the first-named channel is rotatable. On the rear of the pin is a nut with projections shaped so as to be engageable through the window by an electrode end. A spring in the channel engages the nut to move it and the pin rearwardly. A lever having a roller on its inner end engages the nut to move it forwardly as the lever is moved from its angular position. A handle on the outer portion of the lever is positioned so that it will lie close to the metal body when the lever is aligned with the pin. It projects from the metal body when lever is in angular position.

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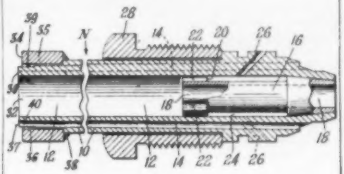
Powder Cutting Tip

2,504,526. EDWARD M. HOLUB, Elizabeth, N. J. Assigned to The Linde Air Products Co. Filed Sept. 3, 1947. Granted April 18, 1950.



A newly patented tip for powder cutting operations comprises a body having a powder-laden cutting-oxygen passage and a series of oxy-fuel gas passages arranged around it. An outer circular recess laterally intersects the discharge ends of the oxy-fuel passages. An outer skirt is mounted on the end of the body in spaced relation to the lateral wall of the recess. It provides a space in communication with the discharge end of the oxy-fuel gas passages for expansion of the gas jets to insure stable preheat flames. The end surface of the outer skirt terminates a substantial amount upstream with respect to the front end surface of the body next to the cutting gas-powder passage. In effect, an inner tip is provided about the discharge end of the passage which protects the oxy-fuel gas jet expansion space from objectionable powder accumulation.

* * *

Resistance Welding Metals of Different Thicknesses

2,498,492. JULIUS HEUSCHKEL, Pittsburgh, Pa. Assigned to Westinghouse Electric Corp., East Pittsburgh, Pa. Filed July 21, 1949. Granted Feb. 21, 1950.

Patent covers a method of resistance welding different thicknesses of metal. The apparatus includes welding electrodes, means for applying force between metals and electrodes and means for supplying welding current. A given force is applied between the electrodes and the metals of one thickness after which a current of given peak magnitude is transmitted through the metals. The time during which the current is transmitted is in accordance with the thickness of the metal being welded. The same given force is applied between the electrodes and metals of a different thickness. Current is transmitted through the second set of metals at substantially the same magnitude but for a time in accordance with the differing thickness.

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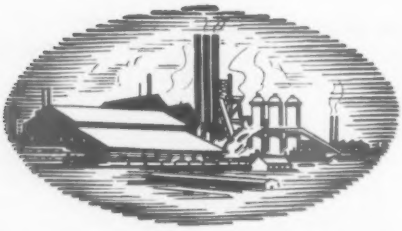

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50,000	"	5/32"	Murex	25-20
16,000	"	5/32"	Page	18-8
7,000	"	5/32"	McKay	19-9
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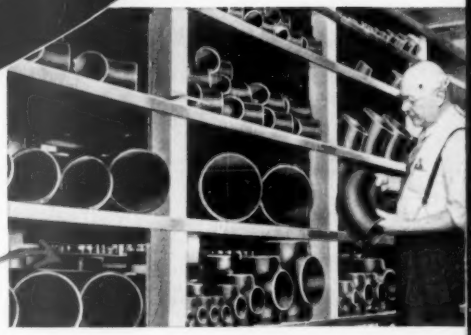

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